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CROTONS OF THE UNITED STATES.

BY A. M. FERGUSON.

In the prosecution of this study I have been very fortunate in having the material from the larger American herbaria, from which to draw the descriptions, namely: Missouri Botanical Garden, including the Engelmann collection, Harvard University, Columbia College, National Museum, including the Smithsonian Institution, California Academy of Sciences, Iowa Agricultural College and the Agricultural and Mechanical College of Texas; and I am not unmindful of the favor extended by the gentlemen who have charge of these collections. Hurried examinations have also been made of the specimens in the herbaria of the University of Chicago, Field Columbian Museum, University of Illinois and the Michigan Agricultural College. About a dozen forms have received field study. I wish to express further acknowledgments to Dr. J. N. Rose of the Smithsonian Institution; for the contributions of notes and specimens, to Messrs. J. Reverchon and Wm. Lomas of Dallas, Texas, Mr. S. B. Parish of San Bernadino, California, Prof. H. Ness of College Station, Texas, and to Dr. Charles Mohr of Mobile, Alabama. Lastly, the kindly interest of Dr. William Trelease has made the preparation of this paper possible. It was through him that the collections mentioned above were secured, and also the use of the excellent facilities for such investigation afforded by the Missouri Botanical Garden. For these favors and other assistance in the way of suggestion, criticism and review, I am very thankful.

The genus to which the forms here treated belong was first named *Ricinoides* by Tournefort.* Linnaeus, wishing

* Tournefort, Inst. Herb. 565. pl. 423. 1700.

to avoid such use of words ending in *-oides*, renamed it *Oxydectes** in 1735, though in 1737 he changed it to *Croton*.† It remained practically intact till the second quarter of the present century. The first monograph was by Geiseler‡ in 1807, who enumerated about one hundred and twenty species. Afterwards, the genus received considerable attention in a scattered way, many sections being segregated and new genera split off from it, chiefly by Klotzsch, though most of his genera were subsequently reunited under *Croton*. Baillon presented the result of his studies of the *Euphorbiaceae* in the Parisian herbaria in 1858 in an elaborate work. He divided the forms covered by this paper, into nineteen sections, besides recognizing five genera now included under *Croton*. The last and most comprehensive work was by Jean Mueller von Argau,§ and his arrangement is the one generally accepted at the present time and has been the basis of my own study.|| Of the ten subgenera recognized by Mueller, seven are represented in our territory, three of which are aberrant groups peculiar to this region.

Croton, like other Euphorbiaceous genera, has few species that admit of a rigid definition of characters. In a restricted locality few variations will be noticed. Especially is this true of *C. Texensis* (Klotzsch) Muell. Arg., and yet the extreme western, the extreme northern and extreme southern forms are in habit characters noticeably different. All *Crotons* are more or less pubescent, either scaly or stellate, and the particular form of these trichomes is often peculiar to a species or higher group. And indeed,

* Linnaeus, Syst. Nat. 1735.

† Linnaeus, Gen. Plant. 288. 1737; Crit. Bot. 37. 1737.

‡ Geiseler, Croton. Monog. 1807.

§ Muell. von Arg., in DC. Prod. 15²: 512 to 700. 1866; and in Martius, Flor. Bras. 11²: 82 to 274. F. 1873.

|| See Bentham, in Benth. and Hook. Gen. Plant. 3: 293 to 296. 1880; also Journ. Linn. Soc. Bot. 17: 223. 1878. Pax, in Engl. and Prantl, Pflanzenfamilien 3⁵: 37 to 40. Ap. 1890.

a recent investigator* has constructed an analytical key for something like one hundred fifty species, depending largely on the pubescence for the distinctive characters.

It has been thought advisable to cite only the original descriptions and others of special interest, and the more common floras of the region covered; and all synonyms where determined. Citations in brackets have not been verified. With a few exceptions, the many names of Rafinesque have not been cited, because of my inability to state beyond serious doubt just what forms he referred to. However, I have gone over most of his publications and conjecturally determined most of his names, and do not think that any of his names could claim priority over the ones here recognized.

CROTON Linn. (Gen. Plant. 288. 1737); Sp. Plant. 1004. 1753.

Herbs or shrubs; scaly or stellate pubescent; leaves alternate, mostly stipulate; monoecious or dioecious. Flowers mostly in terminal spike-like racemes: staminate flowers with a 5- (rarely 4- to 6-) divided calyx; petals 5, when present, alternating with as many glands of the disc, stamens 5 or more, with anthers inflexed in the bud; pistillate flowers with a 3- to 10-parted calyx, the margins of the sepals not dissected; petals present, rudimentary or obsolete; staminodes rare; ovary 3- (rarely 2- to 4-) celled, separating at maturity into as many 2-valved 1-seeded carpels (in *C. monanthogynus*, Michx. the capsules become one-seeded by the regular abortion of one of the two ovules); seeds carunculate. Found usually on sandy soil, or dry rock regions.

* Froembling, Blatt und Axe der Crotoneen und Euphyllantheen. (Bot. Centralbl. 65: 129 &c.) 1896.

KEY TO SPECIES OF CROTON OF THE UNITED STATES.

- I. Staminate and pistillate flowers petaliferous. *C. Alabamensis*.
- II. Staminate flowers petaliferous; petals absent or rudimentary in pistillate flowers.
- A. Scaly. *C. argyranthemus*.
- B. Stellate.
- a. Shrub; margins of leaves entire or nearly so; the 5-parted pistillate calyx not accrescent.
1. Leaves ovate to ovate-lanceolate, cordate or rounded at base.
 Stamens 15 to 35; sepals stellate. *C. Berlandieri*.
 Stamens 10; sepals stellate. *C. fruticosus*.
 Stamens 15; sepals glabrous. *C. Sonorae*.
2. Leaves elliptical to oblong or lanceolate.
 Leaves elliptical, thickish, very densely stellate. *C. suaveolens*.
 Leaves oblong, discolor, stellate above and below. *C. Torreyanus*.
 Leaves oblong to lanceolate, glabrous above; racemes unisexual; capsules bristly pubescent, numerous. *C. Cortesianus*.
3. Leaves elongated-oblong to linear.
 Leaves narrowly linear, glabrous above. *C. linearis*, form A.
 Leaves elongated oblong, microscopically umbonate-stellate above. *C. linearis*, form B.
- b. Shrub, or annual; margins of leaves not entire, base biglandular; branches striate, except in *C. betulinus*; the 4- to 5-parted calyx accrescent.
1. Shrub; leaves ovate, 1 to 2 cm. long. *C. betulinus*.
2. Annual; leaves ovate, 2 to 4 cm. long. *C. Miquelensis*.
3. Annual; erect, slender; leaves elliptical to lanceolate; calyx segments glabrate. *C. Floridanus*.
4. Annual; leaves usually oblong, margins variously interrupted to almost entire. Varieties of *C. glandulosus*.
 Appressed stellate; low; leaves small, 1 to 2 cm., elliptical. *C. glandulosus Lindheimeri*.
 Thinly stellate; upper leaves oblong, entire or serrato-crenate. *C. glandulosus Shorti*.
 Densely stellate; low; leaves ovate, coarsely serrato-crenate. *C. glandulosus Simpsoni*.
 Coarsely stellate; upper leaves oblong, serrate. *C. glandulosus septentrionalis*.
 Thinly appressed stellate; upper leaves elongated-oblong, crenate. *C. glandulosus crenatifolius*.
 Thinly appressed stellate; upper leaves linear, distantly serrate. *C. glandulosus angustifolius*.

- c. Annual; margins of the leaves entire or nearly so; calyx of the short pedicelled, capitate or racemose pistillate flowers 3- to 8-parted and accrescent.

1. Calyx 6- to 8-cleft; styles twice or more bicleft.

Petioles long; leaves slightly or not at all cordate; capsules large, often forming a cluster at base of raceme, covered with a woolly, purplish tomentum. *C. capitatus*.

Petioles short; leaves cordate; pistillate flowers racemose.

Woolly tomentum of the calyx yellowish. *C. Engelmanni*.

Appressed tomentum white. *C. Engelmanni albinoides*.

Petioles short; leaves lanceolate; pistillate flowers capitate, smaller than in *C. capitatus*, not loose woolly. *C. Muellieri*.

Petioles short; leaves linear; sepals hooded. *C. Elliottii*.

2. Calyx very unequally 5-cleft; leaves ovate; styles bicleft.

C. leucophyllus.

3. Calyx 3-cleft by abortion of two inner sepals.

C. leucophyllus trisepalis.

- d. Suffruticose; margins of leaves entire; pistillate flowers long pedicelled, racemose, or rarely from the base of the raceme; calyx 5-parted, often accrescent; capsule 3-celled. *C. corymbulosus*.

- e. Annual; margins of leaves entire; pistillate flowers not racemose, i.e., from the base of the raceme, at length pendent; calyx 3- to 5-parted, sometimes accrescent.

Ovary 3-celled, capsule 3-seeded; leaves oval.

C. Lindheimerianus.

Ovary 2-celled, capsule 1-seeded.

C. monanthogynus.

- III. Pistillate and staminate flowers apetalous; calyx 5-parted, never accrescent; dioecious, or sometimes monoecious in *C. punctatus*; stipules obsolete.

- A. Suffruticose or perennial; branches scurfy, whitish.

- a. Both sides of leaves stellate or scaly-stellate; staminate raceme rarely exceeding 3 cm. in length.

Diffuse; near sea-shore along the lower Atlantic and Gulf coasts. *C. punctatus*.

Procumbent (erect in the varieties) or ascending; leaves long petioled, oblong or oval, stellate. *C. Californicus*.

Leaves stellate, short petioled, oblong to lanceolate.

C. Californicus tenuis.

Leaves oval, only slightly stellate above.

C. Californicus longipes.

Leaves oval, small; stems much branched, digitate.

C. Californicus Mohavensis.

- b. Leaves only slightly, or usually not at all, pubescent above; generally oblong; staminate raceme 4 cm. or more long. *C. Neo-Mexicanus*.

- B. Annual; erect; capsules generally muricate.

C. Texensis.

- C. Annual; slender; capsules yellowish, never muricate (local). *C. virens*.

I. Staminate and pistillate flowers petaliferous.

C. ALABAMENSIS E. A. Smith, in Chapman, Suppl. Fl. South. U. S. 648. 1883; Mohr, Garden and Forest 2: 592. *f.* 150. Dec. 1889; Chapman, Fl. South. U. S. 429. 1897. [3d ed.]

Shrub, 2 to 3 m. tall, the stem 3 to 6 cm. in diameter when grown, spreading, much branched; bark grayish white; leaves persistent till succeeding spring or autumn, subtended by small, exceedingly deciduous stipules (Mohr, l. c.), thin but firm, oblong, 5 to 8 cm. long, 3 to 5 cm. broad, rounded and usually glandless at the slightly oblique base, entire or somewhat undulate, strongly channeled, green and glabrate above, below densely set with overlapping argenteous scales as are also the branches and inflorescence; racemes bi- or unisexual, 3 to 5 cm. long, few to many flowered; staminate flowers 10 to 20 with slightly broader and more rounded, ciliate petals and sepals than the pistillate flowers; stamens 10 to 25; filaments glabrous above; receptacle densely stellate tomentose; pistillate flowers 4 to 7, on pedicels 4 to 8 mm. long at maturity of fruit; calyx 5-parted, the sepals acute, 3 to 4 mm. long, equalling or slightly exceeding the thin narrow, ciliate petals which are scaly on their outer face; glands 5, oblong; ovary bearing 3 flattish, slightly emarginate styles, about 4 mm. long; capsule trigastic, scaly, 6 to 8 mm. long, depressed at apex; seeds oval, 5 to 7 mm. long, unequally biconvex, brown or variegated. — Forming dense thickets and quite local, according to Dr. Mohr. “There are only a few of these thickets of the Alabama Croton, called by the inhabitants of the region ‘Privet brakes’ known, and these all found close together, and it is possible that it does not extend beyond a few miles square.” — Mohr, l. c. — Plate 4.

Specimens examined collected by Mohr, Limestone hills, Little Cahawba River, Bibb Co., June, 1884; Celiohe, 1883; A. W. Wright, a leaf, 1886; E. A. Smith, Cult. at Chattanooga.

II. Staminate flowers petaliferous; petals absent, or often rudimentary in the pistillate.

A. Scaly.

C. ARGYRANTHEMUS Michx. Fl. Bor. Am. 2: 215. 1803; Geiseler, Crot. Monog. 49. 1807; Engelm. and Gray, Boston Jour. Nat. Hist. 5: 233. 1847; Torrey, Bot. U. S. and Mex. Bound. Surv. 195. 1859; Muell. Arg. in DC. Prod. 15²: 576. 1866; Wood, Class Book 631. 1861. *C. punctatus* Coulter, Bot. West. Texas 397. 1894. *Oxydectes argyranthemus* Kuntze, Rev. Gen. Plant. 611. 1891.

Suffruticose, erect, 3 to 6 dm. high, approximately branched above, scaly, argenteous or sometimes ferruginous; lower leaves oval to obovate, upper ones oblong to lanceolate-oblong, 1 to 5 cm. long, narrowed toward the base (an obtuse or rounded base in the oval-leaved forms from south-west Texas), apex obtuse to rounded, scales scattered above, at length almost glabrous, argenteous below; petioles about one half to one fourth the length of the leaves; stipules obsolete; racemes sessile, many flowered, 2 to 5 cm. long; staminate flowers many, upwards of 15, on pedicels 1 to 4 mm. long, with setaceous and very deciduous bracts, normally pentamerous; sepals lanceolate, acute; petals oblong, glabrous on the inside, scaly outside; stamens about 10; filaments with tumid base; pistillate flowers 2 to several, short pedicelled or subsessile at base of raceme; calyx cup-shaped with 5 to 7 acute clefts; apetalous; glandular disc 5-lobed or entire; styles 3, 2 to 4 mm. long, each 3- to 4-palmately cleft at tip; capsules oval, about 5 mm. tall, slightly depressed at the apex, trigastric; seeds oval, 4 to 5 mm. long, unequally biconvex; caruncle prominent and stipitate; calyx accrescent, about one half the length of the capsule. — Georgia to southwest Texas and New Mexico. — Plate 5.

Specimens examined from Georgia (Le Conte; Quitman, no. 188; Small, Albany, 1895); Florida (Curtiss, nos. 2522, 4272, 4932; Duval Co.;

1876; no. 6157, Dry pine barrens, Jacksonville; Canby, 1869; Garber, Gainesville, 1876; Palmer, no. 407, east Fla.; Nash, no. 358, Eustis; no. 1849; Wood, Wakula Spring, 1857; Buckley; Chapman; Webber, no. 126; Hitchcock, 1890; Ferguson, Tampa, 1898); Louisiana (Leavenworth, Tracy, no. 3504); Texas (Berlandier, nos. 294, 1554, 2552; Drummond, no. 333 = 275; Lindheimer, no. 173, 1843; Hall, no. 574; Buckley, 1882; Nealley, 1884; Heller, no. 1547, Corpus Christi Bay), B. Frank, "Civitatis Missouri," 1835, is probably from a middle Gulf state.

B. Stellate.

- a. The 5-parted pistillate calyx not accrescent; margins of leaves entire or nearly so; small much branched shrubs of Florida or the South-west.

1. Leaves ovate to ovate-lanceolate, cordate or rounded at base.

C. BERLANDIERI Torrey, Bot. U. S. and Mex. Bound. Surv. 193. 1859; Muell. Arg. in DC. Prod. 15²: 587. 1866. *C. balsamiferus* Chapman, Fl. South. U. S. 407. 1860; Young, Fl. Texas 484. 1873; Coulter, Bot. West. Texas 399. 1894. *C. humilis* Muell. Arg. in DC. Prod. 15²: 670. 1866; Chapman, Suppl. Fl. South. U. S. 648. 1883; Coulter, Bot. West. Texas 398. 1894. *Oxydectes Berlandieri* Kuntze, Rev. Gen. Plant. 611. 1891.

A low shrub 3 to 8 dm. high; current branches stellate pubescent and viscid, the young branches incanous, at length smooth and whitish; leaves ovate to oblong, 2.5 to 3.5 cm. long, base rounded to subcordate, the basilar glands often abortive, apex mostly abruptly acute, seldom acuminate, margins somewhat repand, the veins usually terminating in minute glands at the margins, tomentose above when young, becoming subglabrous, paler and pubescent below; monoecious or dioecious; the racemes when staminate or bi-sexual are slender and slightly nodding, 3 to 5 cm. long, bearing 2 to 4 scattered pistillate flowers, or when purely staminate becoming longer, 5 to 7 cm.; staminate flowers 3 to 4 mm. broad, pedicels as long; sepals oval; petals spatulate, equalling the sepals, usually ciliate near the base; stamens 30 to 35 in western forms, 15 to 20 in the Florida forms; pistillate racemes 2 to 2.5

cm. long, 3- to 6-flowered, the pedicels about 2 mm. long or by exception longer; sepals oblong-spatulate, about 4 mm. long, apex acute, marginal glands sessile or short stipitate, rarely absent; petals represented by subulate processes 1 mm. or so long; styles 3, palmately 4-parted or abruptly twice biparted, 3 to 5 mm. long, stellate; capsule globose, 4 to 5 mm. tall, trigastic; seeds oval, depressed at the oblong caruncle.

These forms have been alternately referred to *C. balsamiferus* and *C. humilis*. *C. balsamiferus*, according to Muell. Arg., who makes it a variety of *C. flavens*, has 15 to 20 stamens and a biparted style. *C. humilis* has twice biparted styles and 30 to 35 stamens. The Florida forms of *C. Berlandieri* Torrey have 15 to 20 stamens and twice biparted styles, while the Texas forms have 30 to 35 stamens, and similarly divided styles. All our forms are less glandular and more pubescent and have shorter pedicelled flowers than the Jamaica forms of *C. humilis*. Mueller v. Arg. in DC. Prodr. leaves us in doubt as to just how he interpreted their affinities. Under *Eucroton* we have "*C. Berlandieri* (Torr. Mex. Bound. Surv. p. 193) * * * In Novo Mexico ad Nuevo Leon (Thurber n. 708, Berlandier no. 2125 ex Torr.)." Under *Astraea* he has *C. humilis* and the following citations: "* * * * in Mexico orientali prope Matamoras (Berlandier n. 2125!), nec non in Florida (Cabanis! in hb. berol.)," and as a synonym "*C. Berlandieri* Torr. Mex. Bound. Surv. p. 193(ex hb. Kew)."—Plate 6.

Specimens examined from Mexico (Berlandier nos. 708, 2125, Matamoras; Thurber no. 869); Texas (Heller no. 1477, Corpus Christi; Nealley, no. 84 = 453, Brazos Santiago); Florida (Garber, 1877; Blodgett; Curtiss, no. 2520; Palmer, no. 489; Bennett—all from Key West; Chapman, South Florida).

C. FRUTICULOSUS Engelm. in Torrey, Bot. U. S. and Mex. Bound. Surv. 194. 1859; Muell. Arg. in DC. Prodr. 15²: 633. 1866, including the varieties *pallescens* and

fuscescens; Coulter, Bot. West. Texas 398. 1894.
C. Sonorae Millspaugh in Pittonia 2:90. 1890;
 Coulter, l. c. — not of Torrey*. *Oxydectes fruticulosus*
 Kuntze, Rev. Gen. Plant. 611. 1891.

Shrub, 1 or so m. high; branches densely stellate — tomentose, cinereous or frequently yellowish, at length glabrous below; leaves ovate to ovate-lanceolate, 3 to 8 cm. long, 2 to 4 cm. wide, acute or acuminate, entire or remotely and minutely denticulate-glandular, base truncate or cordate, soft tomentose below like the branches and inflorescence, puberulent above, though frequently smoothish and green; petioles 1 to 3 cm. long, a third to a half the length of the leaves; stipules obsolete; monoecious, rarely dioecious; racemes 3 to 12 cm. long, nude at base; staminate raceme interrupted; pedicels 3 to 4 mm. long; bracts small, subulate; calyx of 5 oval, acute sepals; petals

* *C. SONORAE* Torrey, Bot. U. S. and Mex. Bound. Surv. 194. 1859; Muell. Arg. in DC. Prod. 15²: 695. 1866. *C. Pringlei* Watson, Proc. Am. Acad. Arts and Sci. 12: 373. 1885.

Shrub, 1 to 2 m. high, current branches and petioles canescent with fine stellate pubescence; leaves thin, oval to oblong-ovate, 2 to 4 cm. long, acute or acuminate, nearly glabrous above, somewhat thinly mealy-pubescent below, especially on the veins, not glandular at base or on margins, or rudimentary glands exceptional; petioles short, 5 to 10 mm. long; stipules obsolete; racemes generally bisexual, 2 to 8 cm. long, loosely flowered; staminate flowers with the pedicels and 5-divided calyx nearly glabrous; petals oblong, about equalling the sepals, ciliate, especially at the base; glands large and spherical; stamens 15 (12 to 18); filaments slender and glabrous; bracts short, setaceous, glabrous; pistillate flowers 2 to 4, near the base of the raceme; the small bracts and 5 spreading, deltoid sepals glabrous, the short pedicels and ovary stellate; petals linear subulate or absent; gland annular or slightly 5-angled; styles 3, biparted, slender, about 2 mm. long; capsule oblong spherical, glabrescent when old, 5 to 6 mm. wide, 6 to 7 mm. long. — In Torrey's type specimen the styles are bicleft at apex, but the flowers are abnormal. The staminate flowers are also abnormal in that the inner circle of stamens are sessile and invested by a stellate membrane separating them from the others which are normal. — Plate 8.

Specimens examined from Sonora (Schott, III. no. 17, Sierra de Nayas, July, 1855, in Columbia University herb.; Pringle, Northwestern Mts., Aug. 1884; Palmer, no. 180, Ravines and mesas about Guaymas).

5, oblong-spatulate, ciliate, longer than the sepals; glands oval; stamens 9 to 10, exserted, the filaments pilose at the base; pistillate flowers 2 to 5, subsessile; sepals oblong to oblanceolate; petals none or only stellate rudiments; gland annular, slightly lobed; styles 3, divided nearly to the base, terete or channeled, slender, about 5 mm. long; capsule globoid, 5 to 6 mm. tall, depressed at the apex, slightly trigastic; seeds oval, 4 to 5 mm. long; caruncle oblong.—Seemingly quite variable, but this due to different exposures.—Plate 7.

Specimens examined from Texas (Lindheimer, no. 525, Cibola, Comal, Guadalupe and New Braunfels, "Small shrub much branched from the root, on rocky soil"; Berlandier, no. 3212, in part; Wright, no. 639; no. 1803, Limestone hills, Big Bend of Devil's River, 1852; Rio Grande, 1848; Havard, no. 13, Fort Davis, 1881 and 1883; Nealley, no. 527a=456, Chenate Mts., no. 793=456; Buckley, Austin, 1882; Reverchon, no. 1595, "Rocky bluffs on the Llano and southward;" Heller, no. 1842, Kerville,—this like some of Lindheimer's with nearly glabrous leaves; Hall, Austin, 1872; Trelease, San Marcus, 1897; Bodin, no. 526; Jermy, no. 565, Gillespie Co.; Palmer, no 1235, Uvalde; Bigelow, Mts. of Muerta and Bueta, 1852; Leon Springs, 1850; Schott, San Felipe, up to the Pecos Limestone, 1852; Ferguson, 1900); New Mexico (Vasey, Organ Mts., 1881); Mexico (Pringle, no. 264, Santa Eulalia Mts.; South, Cañon of Guadalupe, Sonora).

2. Leaves elliptical to oblong or lanceolate.

C. SUAVEOLENS Torrey, Bot. U. S. and Mex. Bound. Surv. 194. 1859; Muell. Arg. in DC. Prod. 15²:659. 1866; Coulter, Bot. West. Texas 398. 1894.

Shrub, stout, much branched, cinereous or ochroleucous, densely and coarsely stellate-tomentose; branches short, jointed; leaves thickish, ovate or elliptical, entire, obtuse, sometimes mucronate, rounded or narrowed at the base, loose tomentose on both sides, cinereous below, darker above, especially in the Texas forms, 2 to 4 cm. long, 1 to 2.5 cm. broad; petioles short, 5 to 15 mm. long; stipules papillo- or cylindrico-glandular, not often rising above the tomentum; racemes bisexual, unisexual or plants even dioecious, stout, short, 2 to 4 cm. long, closely flowered;

bracts simple or variously lobed or divided, glandular; staminate flowers on pedicels 4 to 8 mm. long; calyx equally 5-parted, the sepals ovate to lanceolate; petals 5, densely ciliate, equalling the sepals; stamens about 15; receptacle tomentose and glandular; pistillate flowers usually 2 or more at the base of the raceme, subsessile or short pedicelled; calyx teeth oblong, acute; petals reduced to small subulate or cylindrical glands; disc with 5 large, oblong glands; styles 3, biparted, 3 to 6 mm. long, terete, or flattish and sulcate; capsule globose, 6 to 7 mm. long; seeds about 5.5 mm. long; calyx not accrescent. — “The *C. suaveolens*, a small shrub in the foot hills of mountains, exhaling a delicious fragrance, would probably likewise make an excellent tea.” * — Plate 9.

Specimens examined from Mexico (Wright, no. 1804, “On the Rio Grande” — Ex Torrey, l. c.; Pringle, no. 140, Rocky hills near Chihuahua); Texas (Havard, no. 12, Ft. Davis; Nealley, nos. 615 = 460, 138, both from Limpia Cañon).

C. TORREYANUS Muell. Arg. in DC. Prod. 15²:579. 1866; Coulter, Bot. West. Texas 398. 1894. *C. suaveolens* var. *oblongifolium* Torrey, Bot. U. S. and Mex. Bound. Surv. 194. 1859.

Shrub 1 to 2 m. high, rather straight, slender, with velutinously stellate branches; leaves oblong to elongated-oblong, generally obtuse at both ends, mucronulate at the apex, densely stellate tomentose and whitish below, dark green and tomentose above, 3 nerved at base, penninerved upwards, 3 to 5 cm. long, 15 to 25 mm. broad; petioles short, 7 to 15 mm. long; stipules subulate, 2 to 3 mm. long, deciduous; staminate raceme many flowered, 2 to 4 cm. long; flowers with oblong subacute sepals; petals oblanceolate, slightly ciliate at base; gland large, thickish; stamens 12 to 15; pistillate flowers generally 3, at base of

* Dr. Havard, U. S. A., Report on the Flora of Western and Southern Texas, in Proceedings of the United States National Museum 8:514. 1885.

raceme, short pedicelled, with 5 subequal, acuminate sepals; petals represented by small subulate bodies covered with tufts of stellate tomentum; ovary densely stellate, the stellates extending well up the lower side of the 3-divided styles; capsule densely stellate, oblong, about 7 mm. long, trigastic, depressed at the apex, 2- to 3-seeded; seeds about 6 mm. long, 4 mm. broad, subequally biconvex, glabrous, depressed at the base of the oblong, stipitate caruncle. — Plate 10.

Specimens examined from Texas (Wright, no. 640, El Paso; Nealley, no. 199 = 462, Hidalgo; Schott [Mex. Bound. Surv. no. 1295], "Rocky ravines near the Rio San Pedro and from there upwards, Oct., 1852"), New Mexico (Wright, no. 1802, Painted Cave); Mexico (Gregg, no. 201, Monterey, no. 819, Papagallas; Thurber, nos. 289 and 868, Papagallas; Palmer, no. 1236, Monclova; Edwards and Eaton, Monterey, 1846). Heller, no. 1429, Nueces Bay, Texas, seems to come under this species.

C. CORTESIANUS Kunth, Nov. Gen. et Sp. Plant. 2: 83. 1817; Muell. Arg. in DC. Prod. 15²: 627. 1866; Coulter, Bot. West. Texas 398. 1894. *C. trichocarpum* Torrey, Bot. U. S. and Mex. Bound. Surv. 196. 1859.

Shrub, 2 to 3 m. high, loosely di- or trichotomous; branches cinereous, stellate pubescent; leaves oblong to lanceolate; subacute or rotund at base; apex acute or acuminate; green and glabrous above, cinereous below, entire or denticulate, 3 to 10 cm. long; petioles 5 to 18 mm. long; racemes unisexual; the staminate interrupted, slender but rigid, 1 to 2 dm. long; flowers small, short pedicelled, with very broad bracts; petals oblong, ciliate at base; stamens 12 to 16; pistillate raceme sessile, short, about 4 cm. long, congested, 15- to 20-flowered, globose, becoming oblong and less hispid at maturity; rachis swollen; flowers sessile; petals linear or rudimentary; gland forming a 5-lobed disc; ovary hispid-stellate; styles 3, biparted, 4 to 5 mm. long; capsule globose, densely and coarsely hispid, depressed at apex, commissure feebly

marked, 6 to 8 mm. tall; seeds about 5 mm. long, 3.5 to 4 mm. broad. — Plate 11.

Specimens examined from Texas (Nealley, no. 178a = 454, Santa Maria, Cameron Co.); Mexico (Berlandier, nos. 824, 1540, 2244, 3003, 3040, 3212 in part and 6503 = 1503 ?, Matamoros to San Fernando, 1828-43; Pringle no. 3079, Las Palmas, no. 1138½, San Luis Potosi to Tampico, is staminate and corresponds to no. 1147).

3. Leaves elongated-oblong to linear.

C. LINEARIS Jacq. [Enum. Pl. Carib. 32. 1760], Amer. Hist. Nat. 257. *t.* 162. *f.* 4. 1763; Lamarek, Encycl. Meth. Bot. 2: 204. 1786; Aiton, Hort. Kew. 3: 374. 1789; Geiseler, Crot. Monog. 6. 1807; Bennett, Jour. Proc. Linn. Soc. 4: 30. 1860; [F. Daniell, On the Cascarilla Plants 13. *t.* 3. *f.* 2 and 3. 1863]; Muell. Arg. in DC. Prod. 15²: 615. 1866; Chapman, Suppl. Fl. South. U. S. 648. 1883. *C. Cascarilla* Linn. Sp. Pl. 1423. 1763. [2d and 3d ed.]; Griseb. Fl. Brit. West Ind. 38. 1864; Woodv. Med. Bot. 629. *t.* 222. 1832; Geiseler, Crot. Monog. 8. 1807. *C. hippophaeoides* Rich. in Ram. de la Sagra, Hist. Nat. etc. Cuba 11: 212. 1850. *Clusia Cascarilla* Linn. Amoen. Acad. 5: 411. 1759. — Not Sp. Pl. ed. 1.

FORM A.* Shrub 1 to 2 m. high, di- or trichotomous, branches scabrous and grayish, the current wood and in-

* Form B, and probably form A, are specifically distinct and the disposition here made of them is to be regarded as tentative only. I was not able to personally examine an authentic specimen of *Croton linearis* or *C. Cascarilla*, but sent specimens of each of our forms to Kew for verification, which was very kindly done. They were returned with the following notes: —

“186, Simpson.

This is true *Croton linearis*, Jacq. It varies much in the breadth and obtuseness of its leaves; in some of the Kew specimens they are 4-5 times as broad as in this specimen and obtuse or retuse.”

[Signed] N. E. BROWN.

“5360, Curtiss.

This appears to be scarcely more than a variety of *C. linearis* Jacq., its leaves varying exactly in the same way, one specimen at Kew (Eggers,

florescence densely stellate and ochroleucous; petioles less than 5 mm. long; stipules obsolete; leaves linear, 4 to 7 cm. long, 3 to 5 mm. wide, apex obtuse, slightly narrowed toward the biglandular base (glands sessile, often abortive), dark green, smooth and channelled above, lateral veins absent or very dimly marked, margins entire and plane or very slightly inflexed, densely stellate-tomentose and argenteous below; dioecious; racemes terminal or pseudo-axillary, several- to many-flowered, interrupted; staminate raceme 4 to 8 cm. long or longer; flowers about 2 mm. broad, on pedicels about 1 to 2 mm. long; calyx of 5 to 6 subequal, deltoid sepals; petals spatulate, obtuse, ciliate, longer than the calyx; stamens about 15, exserted; receptacle pilose; pistillate raceme 4 to 5 cm. long, frequently exceeded by the leaves, 4- to 7-flowered, pedicels 2 to 3 mm. long at maturity of fruit; bracts deltoid, the two lateral ones small; sepals acuminate, incanous; gland annular; petals rudimentary or none; styles 3, short and stout, bicleft or exceptionally twice bicleft; capsule subglobose, strongly trigastrie, 5 mm. long, depressed at the apex, covered with a flocculose ochroleucous pubescence; calyx not accrescent; seeds oblong, 3 mm. long, angulate-convex. — Plate 12.

Specimens examined from Florida (Blodgett, Pine Key; Garber, no. 292; Simpson, no. 250, Big Pine Key, no. 186, No Name Key; Pollard, et al. Big Pine Key, 1898).

FORM B. Shrub, probably 1 m. or so high, much branched; stems grayish or whitish, the branchlets, lower sides of the leaves and inflorescence, densely stellate and yellowish, the upper side of the leaves green, but densely covered with very minute, umbonate stellates; margins entire, inflexed in dried specimens, elongated oblong, 3 to

4013) being identical in habit and narrowness of leaf with 186, Simpson. It differs from *C. linearis*, however, in having fewer female flowers in a raceme, with longer pedicels, and in the minute tomentum on the upper surface of the leaves."

[Signed] N. E. BROWN.

4.5 cm. long, 6 to 12 mm. wide, round at the apex, narrowed at the base, channelled above; petioles .5 to 1 cm. long, sulcate; stipules obsolete; dioecious; staminate raceme 3 to 5 cm. long, stout, interrupted, 12- to 25-flowered; pedicels about 2 mm. long; flowers about 2.5 mm. broad; sepals acute and deltoid; petals densely ciliate, oblong-clavate, 2.5 to 3 mm. long, longer than the sepals; stamens about 15; receptacle pilose; pistillate raceme 2 to 3 cm. long, bearing about 6 flowers; pedicels about 2 mm. long at maturity of the subglobose capsule, which is about 5 mm. tall, triquetrous, 1- to 3-seeded; styles bicleft, stout, about 1.5 to 2 mm. long; seeds punctate-impressed, truncate at the oblong caruncle, 3.5 to 4 mm. long. — This cannot be *C. Cascarilla* and very doubtfully even a form of *C. linearis*, because of the dense pubescence on the upper side of the leaves. See foot-note, page 46. — Plate 13.

The material observed so far is as follows: Curtiss, no. 2525c, Biscayne Bay, 1881, no. 5360, Sand ridges near the ocean, Palm Beach, 1895; Palmer no. 488, Biscayne Bay, 1874; Hitchcock, Watling, Bahama, 1890.

- b. Shrub or annual; branches striate, except in *C. betulinus*; the 4- to 5-parted calyx accrescent; margins of leaves not entire, base biglandular.

C. BETULINUS Vahl, Symb. Bot. **2**: 98. 1791, in Geiseler, Crot. Monog. 53. 1807; Muell. Arg. in DC. Prod. **15**²: 595. 1866; Chapman, Suppl. Fl. South. U. S. 648. 1883; l. c. 430. 1897. [3d ed.]

Shrub, 1 to 2 m. high, thichotomous; branches slender, pubescent with short, spreading, stellate hairs, the tips incanous; leaves ovate, 1 to 2 cm. long, apex obtuse, base rotund or truncate and biglandular, crenato-dentate, basilar margin subentire, stellate, the hairs fine and loosely spreading above, subappressed-tomentose below; petioles about one half the length of the leaves; stipules small, short and thick; racemes 2 to 3 cm. long, many flowered; bracts lanceolate, 1 to 2 mm. long, persistent, their stipular

glands relatively large; staminate flowers on pedicels 1 to 2 mm. long; sepals oblong-oval; petals oblanceolate, ciliate; stamens 9 to 12, barely exserted, pilose at the base of the filaments; pistillate flowers 1 to 3, subsessile at the base of the raceme, calyx of 5 subequal clavate sepals; petals small, subulate, or sometimes obsolete; gland prominent, the lobes extending about one third the length of the sepals; styles 3, biparted, 1 to 2 mm. long; capsule pilose, oblong-oval, 4.5 to 5 mm. long; seeds oblong, punctate, 3 to 3.5 mm. long, caruncle stipitate; calyx accrescent, nearly equalling the capsule. — Plate 14.

Specimens examined from Florida: Curtiss no. 180, Rocky pine woods bordering Bay of Biscayne, no. 5840, Miami.

C. MIQUELENSIS n. n. *C. chamaedryfolius* Griseb. Fl. Brit. West Ind. 41. 1864; Muell. Arg. in DC. Prod. 15²:686. 1866. — Not Lamarek, Encycl. Meth. Bot. 2:215. 1786, which is an *Acalypha*. *Geiseleria chamaedryfolia* Klotzsch, in Hooker, London Jour. Bot. 2:47. 1843; Miquel, Stirp. Surinam. Select. 99. pl. 30. 1850.

Annual, 4 to 8 dm. high, short stellate-pubescent; leaves ovate-lanceolate, 2 to 4 cm. long, crenato- or serrato-dentate, base often oblique, generally truncate or slightly cordate, biglandular, finely pubescent below, puberulent above; petioles about 1 cm. long, shorter above; raceme short, usually about 1 cm. long, generally simple and terminal; staminate flowers few, on short pedicels; bracts setaceous, the stipular glands small; petals narrowly oblong and ciliate; stamens 8 to 10; pistillate flowers 3 to 4, on bracteate pedicels 2 to 5 mm. long, the upper ones almost equalling the staminate portion of the raceme; calyx of 5 subequal, lanceolate sepals; petals none, or mere rudiments; styles 3, biparted; capsule globose, 3 to 3.5 mm. broad, almost equalled by the accrescent sepals.

Collected by Curtiss, no. 15, ballast earth at Pensacola, Florida, 1886.

C. FLORIDANUS n. sp.

Annual or suffruticose, ligneous, slender, erect, freely branching, di- or trichotomous above, appressed stellate, scabrous, 2 to 5 dm. high; leaves ovate or elliptical below, lanceolate or oblong above, 1 to 2 cm. long, serrato-crenate, short petioled, with two subsessile glands at the base; stipules small and subulate; racemes 2 to 4 cm. long, sessile, 10- to 20-flowered; staminate flowers small; bracts bistipulate-glandular; sepals ovate; petals narrow, ciliate; stamens about 10; receptacle pilose; pistillate flowers 1 to 4, at base of raceme, short pedicelled or subsessile; bracts large, deltoid; calyx segments smooth, oblanceolate or linear, equalling or slightly exceeding the capsule; gland strongly 5-lobed; receptacle velutinous; petals mere subulate rudiments; styles 3, biparted; capsule oval, unequally triquetrous, about 4 mm. long; seeds oval, 3 mm. long, strongly biconvex; caruncle large and thickish.—Plate 15.

Specimens examined from Florida (Curtiss no. 2523, Gasparilla Key, in sand, no. 5398, sandy ground near Lake Worth Inlet, no. 5956, dry pine barrens near Hains City; Garber, Sarasota, 1876; Chapman, Punta Pass; Simpson, 1880, Sarasota Bay, no. 391, San Carlos Bay, 1891.

C. GLANDULOSUS LINDHEIMERI Muell. Arg. in DC. Prod. 15²: 685. 1866; Coulter, Bot. West. Texas 399. 1894.

Low, 2 to 4 dm. high, striae on stems not conspicuous; stellate hairs short and subappressed; lower leaves elliptical or oblong-ovate, 1 to 3 cm. long, upper 1 to 1.5 cm. long; apex obtuse, margins denticulate or serrulate to subentire, puberulent above, grayish-green below.—Plate 16, f. 3.

Specimens examined from Texas (Lindheimer no. 691, Llano; Palmer no. 1244, Wilson Co.; Croft, San Diego, 1884–88; Buckley, Austin, 1882; Nealley, Corpus Christi, 1889; Schott, in Mexican Boundary Survey [no. 1303], 1852).

C. GLANDULOSUS SHORTI n. var.

Lower leaves oval, equalling the petioles in length, 2 to 5 cm. long, upper ones oblong, the petioles shorter; apex

obtuse or rotund, margins sinuate or serrato-crenate, except the basal margin which is entire; minutely stellate-pubescent below, puberulent above. — In the Engelmann Herbarium, labelled “Croton — Ex Semin. Texen.”, on one of Dr. Short’s labels with the date added after Kentucky, 1850. — Plate 16, f.1.

C. GLANDULOSUS SIMPSONI n. var.

Stem branching freely, 2 to 3 dm. high, pale, densely pilose, the central hair of each stellate long and at right angles to the stem, the lateral appressed; leaves oval to ovate, basal margins serrulate or entire, otherwise coarsely serrato-crenate, tomentose below, 2 to 3.5 cm. long, 1.5 to 3 cm. broad; petioles biglandular at the base of the leaf, 2 to 3 cm. long on the lower leaves, shorter above; raceme sessile, 1 to 2 cm. long, exceeded by the leaves, 10- to 20-flowered, congested; staminate flowers short pedicelled; bracts linear and hirsute; sepals oblong, very thin; petals oblanceolate, ciliate at the base; stamens about 10; receptacle pilose; pistillate flowers nearly sessile; bracts linear; calyx generally subequally 5-parted; sepals linear to oblanceolate; petals short, subulate rudiments or obsolete; styles 3, biparted, 1 to 2 mm. long; capsule globose, 5 to 6 mm. tall, pilose; seeds about 4 mm. long, punctulate; caruncle large.

Collected by Simpson, dry rocky soil, Cocanut Grove, Florida, 1892.

C. GLANDULOSUS SEPTENTRIONALIS Muell. Arg. in DC. Prod. 15²: 686. 1866; Coulter, Bot. West. Texas 399. 1894. *C. glandulosus* of American authors. *Geiseleria glandulosa* Klotzsch, in Wiegmann, Archiv für Naturgeschichte 7: 254. 1841.

Slender annual, 4 to 16 dm. high; stems pale, stellate-hirsute, the central hair 1 mm. or more long, the lateral hairs shorter and somewhat appressed; lower leaves oval to oblong-ovate, 3 to 5 cm. long, upper ones lanceolate or

narrowly oblong, 3 to 6 cm. long, 5 to 20 mm. broad, coarsely serrate, the serratures often somewhat dentate, base and apex obtuse with two stipitate, saucer-shaped glands at the base; petioles 1 to 2 cm. long; raceme 1 to 3 cm. long, the 2 to several pistillate flowers clustered at the base; calyx 5-parted; petals represented by subulate processes; styles 3, biparted; capsule subglobose, 4 mm. tall, trigastic, stellate; seeds oval, 3 to 4 mm. long, punctulate; calyx accrescent, nearly equalling the capsule at maturity; staminate flowers congested, short pedicelled; bracts narrowly oblong and minutely glandular at the base (see fig. 1, 2, pl. 17); calyx 5- (4- to 6-) divided, the sepals oblong ovate; petals narrowly oblong; stamens 6 to 11. — Plate 17.

Specimens examined from Florida (Chapman; Nash, no. 579; Curtiss, nos. 2523, 4273, 4933, 5683; Simpson, 1890; Hitchcock, 1894; Webber, no. 504; Palmer, no. 490, Indian river, 1874, has more appressed pubescence and resembles the species very closely); Alabama (Buckley, 1841; McCarthy, 1888; Earle and Baker, no. 11); Mississippi (Skehan, 1895; Tracy, nos. 2889, 2890, 3440, 4726; Pollard, no. 1102); Louisiana (Hale, no. 471; Frank, 1837); Tennessee (Kearney, 1894); Georgia (LeConte; Grosvenor, 1864; Small, 1893); South Carolina (Coville, no. 124; Ravenel, 1869); North Carolina (Hymans, 1880; McCarthy, 1885; Kelly, 1891; Small, 1894; Gray and Carey, 1841); Virginia (Heller, no. 1153); Illinois (Geyer, 1842; Bebb, 1861; Vasey; Patterson; Seymour, 1886); Iowa (Reppert; Hitchcock, 1889; Pammel); Kansas (Kellerman, 1888; Hitchcock, no. 994; McKenzie, 1895); Missouri (Engelmann, 1870; Pech, 1861; Eggert, 1878, 1893; Letterman, 1882; Dewart, 1892; Bush, no. 123; 1892; 1893; Dean; Trelease, 1890, 1897; Savage and Steele, 1897); Arkansas (Engelmann, no. 6, 1835; Nuttall; Pitcher); Indian Territory (Palmer, no. 308a; Bush, no. 551); Oklahoma (Oliver, no. 116); Texas (Lindheimer, no. 691b; Palmer, no. 2056; Ness, 1897; Buckley, 1882; Pammel, 1888; Heller, no. 4150; Ferguson, 1895 and 1899); and the following of uncertain locality: James, "Source of the Canadian"; Bigelow in Whipple's Expedition, 1853-4; Wright, no. 273 or 638.

A form, reported as "Common below the Navy Yard, Philadelphia" (Diffenbough, 1864; Martindale, 1865; and Parker, 1866, 1867, "On ballast ground"), is *C. glandulosus scordioides* (Lam.) Muell. Arg. Also collected at Mobile, Alabama, by Dr. Mohr.

C. GLANDULOSUS CRENATIFOLIUS n. var.

Leaves crenate or serrato-crenulate, elongated oblong,

about 3 cm. long, 5 to 10 mm. wide, sparsely stellate; stem very slender.

Specimens examined from Florida (Simpson, no. 391, San Carlos Bay, 1890; Blodgett, Charlotts . . . and Pine Key; Henderson; Hitchcock, 1890).

C. **GLANDULOSUS ANGUSTIFOLIUS** Muell. Arg. in DC. Prod. **15**²: 696. 1866; Coulter, Bot. West. Texas 399. 1894.

Stems slender, stellate pubescence appressed; lower leaves linear-lanceolate, remotely and obtusely serrate, glabrate above, puberulent below, 5 to 7 cm. long; the petioles 2 to 3 cm. long; stipules subulate; upper leaves linear, 4 to 5 cm. long, 4 to 7 mm. broad. — Plate 16, f. 2.

Specimens examined from Texas (Drummond, nos. 241, 334; Lindheimer, no. 172, 1843, and at Houston, 1842; Thurrow, 1890; Hall, no. 571, Giddings); and, doubtfully included here, Frank "in regionibus fluminis Mississippi", 1837; Vesterland, Orange Co., Florida, 1889.

c. Annual; calyx of the short pedicelled, capitate or racemose pistillate flowers 3- to 8-parted and accrescent; margins of the leaves entire or nearly so; tomentum very dense and close, velvety.

1. Calyx very slightly unequally 6- to 8-cleft; styles twice or more bicleft.

C. **CAPITATUS** Michx. Fl. Bor. Am. **2**: 214. 1803; Geiseler, Crot. Monog. 66. 1807; Wood, Class Book Bot. 631. 1865; Muell. Arg. in DC. Prod. **15**²: 687. 1866; Gray, Man. Bot. 391. ed. 1857; Coulter, Bot. West. Texas 399. 1894; Chapman, Fl. South. U. S. 430. 1897 [3d ed.]. *Pilinophytum capitatum* Klotzsch, in Wiegmann, Archiv für Naturgeschichte **7**: 255. 1841. *Heptallon graveolens* Rafinesque, Neogenyton 1. 1860. Ex Muell. Arg.

Annual, erect, 3 to 8 dm. high, approximately branched above; leaves oval below, oblong to elongated-oblong above, 2 to 5 cm. long, entire, apex obtuse and mucronulate, base rotund, rarely cordate, sometimes minutely biglandular; lower side of the leaves, petioles and branches densely stellate-tomentose; upper side velutinous and

darker; petioles of lower leaves as long as, or slightly longer than the leaves; upper ones shorter; stipules subulate or obsolete; staminate flowers short pedicelled; bracts filiform and branched; sepals equal, oval, densely stellate; petals 5, narrow, ciliate; stamens 7 to 12, slightly exserted; filaments short ciliate; pistillate flowers generally clustered at the base of the short (1 to 3 cm. long), raceme, densely soft woolly with a purplish tinge; stellates long stalked or stipitate in the inflorescence, subsessile or short pedicelled elsewhere; calyx unequally 6- to 8-parted, the sepals oblanceolate or oblong; petals none; disc orbicular, glandless or glands rudimentary; styles 3, 2 to 3 times bicleft, 5 to 6 mm. long; capsule globose, 7 to 9 mm. long, densely tomentose, slightly exceeded by the accrescent woolly sepals; seeds orbicular, strongly biconvex, 5 mm. long; caruncle small, stipitate. — Plate 18.

Specimens examined from New Jersey (Kniskern, 1846); Illinois (Vasey, 1860; Seymour, 1880; M. B. W. 1887; Hall, 1861; Buckley, 1838; Williams, 1879; Vasey; French; Bebb, 1860); Kentucky (Short, 1831, 1835); Missouri (Frank, 1835; Bush, nos. 122, 335, 372; Dewart, no. 60; Letterman, 1880; Buttlar, no. 87; Blankinship, 1887; Pammel, 1886; Trelease, 1897; Engelmann; Burgess); Arkansas (Nuttall; Pitcher; Rolfs, 1891); Louisiana (Hale; Holloway); Tennessee (Fendler; Ward, 1877; Gattinger = Curtiss, no. 2524; Bain, no. 215); Texas (Lindheimer, no. 304; Thurber, no. 288; Reverchon, 1874; Buckley, 1882; Lomas, 1897); Oklahoma (De Barr, no. 280); Indian Territory (Palmer, 1863, no. 309 in 1868; Burrill; Butler, 1877; Ward, no. 11, in part; Carleton, no. 502; Bush, no. 553); Kansas (Popenoe, 1873; Bodin, 1887; Smythe, no. 327; Waugh, 1892; Norton, 1892; Gayle, no. 545); Iowa (Parry; Rolfs; Hitchcock, 1887, 1889); Alabama (Baker, no. 2; Mohr); North Carolina (Biltmore herb., no. 3740).

C. ENGELMANNI n. n. *Pilinophytum Lindheimeri* Engelm. and Gray, Pl. Lind. 24. 1845 (Boston Jour. Nat. Hist. 5:232); *C. capitatus Lindheimeri* Muell. Arg. in DC. Prod. 15²:687. 1866; Coulter, Bot. West. Texas 399. 1894. *C. Lindheimeri* Wood, Class Book Bot. 631. ed. 1865; Young, Fl. Texas 485. 1873.

Annual, erect, 5 to 20 dm. high, much branched, umbel-

lately or approximately so above, finely and densely stellate-tomentose throughout; lower leaves 1 to 2 dm. long, the petioles about as long; upper leaves 4 to 12 cm. long and short petioled, lanceolate, acuminate, mucronate, entire or unevenly serrulate, base rotund, but generally becoming cordate; stipules setaceous, 4 to 6 mm. long, covered with stipitate stellates; raceme 5 to 15 cm. long, interrupted, oblong or pyramidal, loosely woolly and with a distinct yellowish tinge, the stellates long stipitate; staminate flowers on pedicels 5 mm. long; stamens 9 to 12; filaments stellate-ciliate at base; petals oblanceolate, ciliate; sepals ovate, acute; pistillate flowers usually 3 on the lower part of the raceme, not clustered at its base; pedicels short; bracts like the stipules or branched; calyx densely woolly, 7- to 8-parted, the 3 or 4 outer sepals with very small, acuminate, scale-like glands at their bases; capsule somewhat compressed, 6 to 8 mm. tall, trigastic; styles 3, twice bicleft, 6 to 10 mm. long; seeds oval, 4.5 to 5 mm. long. — Plate 19.

Specimens examined from Georgia (Chapman, and McCarthy, no. 27, 1888, both at Rome); Florida (Curtiss, no. 6498, Pensacola); Alabama (J. D. Smith, 1884; McCarthy, Colera, 1888); Arkansas (Harvey, no. 12); Mississippi (Skehan, 1895; Pollard, nos. 1081, 1270; Tracy, nos. 4723, 4727); Louisiana (Hale, Gregg, 1847; Daves, 1889; Leavenworth; Carpenter, no. 23; Tracy, no. 3461; Langlois, no. xx, 1884); Texas (Drummond, nos. 224, 258; Lindheimer, nos. 60, 171, 239; Gregg; Wright; Hall, no. 372; Parry, no. 829½; Wurzlów, no. 51; Crawford, nos. 11, 14; Buckley, 1882; Thurrow, 1890; Palmer, no. 1238; Ness, 1896; Mohr, 1892; Ferguson, 1895, 1899). Also cultivated in St. Louis from Texas plantlets obtained through the kindness of Prof. Ness; cultivated specimens of Engelmann and Hall.

C. ENGELMANNI ALBINOIDES n. var.

Similar to the preceding but larger, stouter and more branched; lower leaves broadly ovate; upper leaves much longer, ovate-lanceolate, and cordate; pubescence white, never yellowish or purplish, finer and more appressed than in the two preceding forms. — Growing with the species,

but intermediate forms have not been observed. — Southwest Texas and northward.

Specimens examined from Texas (Havard, nos. 4 and 5; Heller, no. 1800; Wooton, no. 227; Pringle, no. 2073; Ferguson, several collections in 1899); Indian Territory (Ward. no. 11, in part).

C. MUELLERI Coulter, Bot. West. Texas 399. 1894. *C. Berlandieri* Muell.

Arg. in *Linnaea* 34: 141. 1865; DC. Prodr. 15²: 688. 1866. *Heptal-
lon aromaticum* Rafinesque, Neogenyton 1. 1860. Ex Muell. Arg.

Perennial (?), 8 to 12 dm. high, the entire plant covered with a very fine stellate tomentum; leaves ovate to lanceolate, entire, acuminate; base obtuse, 3 to 6 cm. long, 8 to 15 mm. broad; tomentum appressed, fine; petioles 1 to 2 cm. long; stipules about 3 mm. long; racemes oblong, 2 to 3 cm. long, not capitate, tomentose but not loose woolly; staminate flowers small, short pedicelled; sepals ovate; petals ovate and ciliate at their base; stamens about 10, the filaments and receptacle pilose; pistillate flowers subsessile or short pedicelled; calyx unequally 6- to 7-parted; petals none; gland disc-shaped but very unequally lobed; styles 3, twice bicleft or palmately 4-cleft, about 2 mm. long; capsule globose, slightly depressed at the apex, trisulcate, about 4 mm. tall; seeds oval, about 3.5 mm. long. — Found in Mexico near the border and possibly occurs in our territory. — Specimens examined collected by Berlandier, nos. 861, 2281, Llano de Santa Teresa, Matamoras to San Fernando, 1830. — Plate 20.

C. ELLIOTT Chapman, Fl. South. U. S. 407. 1860;

Muell. Arg. in DC. Prodr. 15²: 688. 1866. *C. ellipticum*

Elliott, Sketch Bot. S. C. and Ga. 2: 648. 1824.

Ex Chapman. — Not Nuttall, which is *C. monanthogynus* Michx.

Annual, slender, probably 4 to 8 dm. high, stem scabrous below, short appressed stellate above, repeatedly and approximately branched; leaves linear, 4 to 5 cm. long below, 2 to 3 cm. above, 4 to 8 mm. wide, entire, apex generally obtuse; base 1- to 3-nerved, cinereous-tomentose below, darker and velutinously short stellate above; petioles 5 to 20 mm. long; raceme 1 to 2 cm. long, tomentose; staminate flowers several, short pedicelled; bracts setaceous; sepals 5, elongated-oblong; petals linear, ciliate; stamens 8 to 10; pistillate flowers subsessile and clustered at base of the raceme; sepals 6 to 7, unequal, loose tomentose; petals none; glands annular, thin or sometimes

rudimentary; styles 3, twice bicleft, 2 to 3 mm. long; capsule globose, 4 to 5 mm. tall, tomentose, equal to or exceeded by the accrescent sepals, the apices of which are semihooded; seeds oval, 3 to 4 mm. long. — Plate 21.

Specimens examined collected by Chapman, Quincy, Florida, 1835.

2. Calyx very unequally 5-cleft, the two inner sepals being much reduced; styles bicleft.

C. *LEUCOPHYLLUS* Muell. Arg. in *Linnaea* **34**: 139. 1865; DC. Prod. **15**²: 681. 1866; Coulter, Bot. West. Texas **399**. 1894.*

Annual, 3 to 5 dm. high, di- or trichotomous, densely stellate-tomentose, white or yellowish; stipules about 1 mm. long; petioles nearly as long as the ovate to oblong-ovate leaves; leaves 2 to 3.5 cm. long, 1 to 2 cm. broad, entire, apex obtuse, base rounded, pale below, darker and scabrous (papillate) above; raceme short, 1 to 2 cm. long, congested; staminate flowers short pedicelled; sepals 5, oval; petals oblong; stamens 8 to 10; pistillate flowers short pedicelled; calyx unequally 5-parted, 3 outer sepals oblong, 2 inner smaller and abruptly subulate; petals none; gland narrow and thin; styles 3, bicleft, 1 to 2 mm. long; capsule subglobose, 4 to 5 mm. tall, trisulcate, depressed at the apex, the tomentose calyx lobes about two-thirds the length of the capsule; seeds oval, 3 to 4 mm. long, thick. — Plate 22.

Specimens examined collected by Berlandier, no. 614 (ex. 2), July 1823; no. 2424, July 1825, Southwest Texas.

* A Mexican variety of this species may be characterized as follows: —

C. *LEUCOPHYLLUS* *TRISEPALIS* n. var.

Annual, 4 to 5 dm. high, densely coarsely stellate-tomentose; leaves ovate to oblong, 2 to 5 cm. long, 1.5 to 3 cm. broad, base rounded, apex obtuse, margins crenato-dentate or entire, densely tomentose, looser and lighter below; petioles stoutish, nearly as long as or longer than the leaves; stipules setaceous, 5 mm. long; raceme 2 to 4 cm. long, congested, with about 5 to 8 pistillate flowers; capsule about 5 mm. tall; equalled by the 3 outer sepals, the inner abortive. — Specimens examined from Monterey, Mexico, collected by Gregg, no. 165, 1848; Pringle no. 2225, 1888.

- d. Suffruticose, or low annual; Calyx 5- (rarely less) parted, often accrescent, on long pedicels and often reflexed; ovaries 2- to 3-celled; capsules 1- to 3-seeded.

C. CORYMBULOSUS Engelm. in Torrey, Bot. Wheeler Exped. 242. 1878; Coulter, Bot. West. Texas 397. 1894.
C. Lindheimerianus Torrey, Bot. U. S. and Mex. Bound. Surv. 194. 1859; Muell. Arg. in DC. Prod. 15²: 579. 1866. *Oxydectes Lindheimeri* Kuntze, Rev. Gen. Pl. 612. 1891.

Suffruticose, the several erect ligneous stems springing from the root, simple below, somewhat corymbose above, argenteous throughout; leaves broadly oval to oblong, 2 to 4.5 cm. long; apex mucronulate; base rounded; stellate pubescence closely appressed above, slightly looser below; petioles of stem leaves long, one half or more as long as the leaves; stipules subulate to foliaceous, deciduous; inflorescence compact and oval when young, at length becoming loose and corymbulose or cylindrical, 1 to 3 cm. broad, 2 to 4 cm. tall, the peduncle exceptionally elongating to 8 to 10 cm.; unisexual or bisexual, sometimes staminate, sometimes pistillate flowers predominating, or even dioecious forms frequent; staminate flowers on pedicels 4 to 6 mm. long; bracts setaceous, 1 to 2 mm. long; calyx 5-parted, petals spatulate, and densely bearded; stamens 6 to 18, ciliate along their tumid bases, 5 to 8 mm. long, one-half exserted; pistillate flowers on slender pedicels 6 to 12 mm. long at maturity of fruit or exceptionally longer (3 to 6 cm.), spreading or reflexed, apetalous, or subulate rudiments often present; glandular disc 5-lobed; styles 3, biparted, 3 to 8 mm. long, slender; capsule oval or oblong, 4 to 7 mm. tall, the calyx often one third as long; seeds oblong, truncate at both ends; caruncle prominent, stipitate. — Plate 23.

Specimens examined from Texas (Wright, 1848, no. 641, 1849; Buckley, 1883; Gregg, nos. 71, 288; Duffy, 1860; Jones, no. 4201; Letterman, no. 57; Girard, 1880; Nealley, nos. 367 = 455, 795 = 455, 459 = 462 in part; Reverchon, no. 134, in Eng. Herb. = Curtiss, no. 2525*d*; Boyd;

Havard, 1883, no. 32, "on T. P. R. R.", a very large-leaved form with an unusually developed raceme of only pistillate flowers, 12 cm. long, pedicels 4 to 6 cm. long, but not reflexed); New Mexico (Rothrock, no. 506; Rusby, no. 375; Vasey, no. 452, 1881; Mearns, no. 152; Mulford, nos. 616, 761, 948; Wright, no. 1805); Arizona (Rothrock, 1874; Pringle, 1884; Lemmon, no. 461; Palmer, no. 242; Wilcox, no. 276; McDougal, no. 793; Schott and Parry, 1852); Mexico (Palmer, no. 1245, in Coahuila; Hartman, no. 806, in Chihuahua; Thurber, no. 337, in Sonora and no. 706, in Chihuahua, "Common on sandy plains from Gila to Rio Grande").

C. LINDHEIMERIANUS Scheele, in *Linnaea* 25:580. 1852; Coulter, Bot. West. Texas 399. 1894; Small, in Britton and Brown, Ill. Fl. U. S. and Can. 3:518. *f.* 2292a. 1898. *C. ellipticus* Muell. Arg. in DC. Prod. 15²:688. 1866. *C. eutrigynus* A. Gray, Man. Bot. 438. 1867. *Oxydectes elliptica* Kuntze, Rev. Gen. Pl. 611. 1891.

Annual, 3 to 5 dm. high, 2- to 4-chotomous, appressed pubescent throughout, greenish, incanous only on younger branchlets; leaves oval or rhomboid-elliptical, 1 to 3 cm. long, somewhat oblong above, apex shortly rounded, sometimes retuse, base truncate or cordate, entire or undulate, cinereous below; petioles about as long as the leaves; staminate flowers in short few-flowered racemes; pedicels 3 to 4 mm. long; bracts setaceous; sepals generally ovate; petals 5, clavate, densely ciliate; glands thin; stamens 7 to 12, the filaments nearly smooth; receptacle pilose; pistillate flowers solitary or in twos or threes from the base of the raceme, apparently from the forks as in *C. monanthogynus*, very rarely racemose as in *C. corymbulosus*, long pedicelled, 5 to 15 mm. at maturity, becoming pendent; sepals 5, subequal, concave, obovate or lanceolate; petals none or only rudiments; glandular disc thin, lobed; styles 3, biparted, about 3 mm. long; capsule oval or cylindrical, 4 to 5 mm. long, truncate or obtuse at both ends, 3-celled and generally containing 3 oblong, punctulate seeds; caruncle large, stipitate; calyx lobes more or less accrescent, becoming

oblanceolate, one half to two thirds as long as the capsule. — On sandy soils. — Plate 24.

Specimens examined from Kansas (Hitchcock, no. 991, in sandy soil, Harper Co.); Indian Territory (Palmer, nos. 307, 308, "Between Ft. Cobb and Ft. Arbuckle; Sheldon, no. 301; Butler, no. 6 (?), 1877); Oklahoma (Oliver, no. 117); Texas (Berlandier, nos. 649, 2059; Lindheimer, no. 526; Reverchon = Curtiss, no. 2525a, no. 871; Buckley, 1875; Wright, "dist. 575," 1849; Ness, 1893; Palmer, no. 1241; Croft, no. 25; Havard; Nealley, no. 225 = 457, no. 459 = 457; Ferguson, 1899); Mexico (Wilkinson, 1885).

C. MONANTHOGYNUS Michx. Fl. Bor. Am. 2: 215. 1803; Geiseler, Crot. Monog. 68. 1807; Adr. Jussieu, Tent. Euphorb. 30. 1824; A. Gray, Man. Bot. 392. 1857; Chapman, Fl. South. U. S. 408. 1860; Young, Fl. Texas 485. 1873; Wood, Class Book Bot. 631. 1881; Coulter, Bot. West. Texas 400. 1894; Small, in Britton and Brown, Ill. Fl. U. S. and Can. 2: 363. f. 2292. 1897. *C. tomentosus* Schecut, Fl. Carol. 471. 1806. *C. ellipticus* Nuttall, Gen. N. A. 2: 225. 1818; Wood, Class Book Bot. 489. 1847; Darby, Bot. South. U. S. 499. 1855. *Argothonia herbacea* Sprengel, Syst. Veg. 3: 848. 1826. *Engelmannia Nuttalliana* Klotzsch, in Wiegmann, Archiv für Naturgeschichte 7: 253. 1841. *Gynamblosis monanthogyna* Torrey, in Marcy, Expl. Red River 282. 1854; U. S. and Mex. Bound. Surv. 196. 1859. *Angelandra elliptica* Baillon, Etude Gen. Euphorb. 379. 1858. *Oxydectes monanthogyna* Kuntze, Rev. Gen. Pl. 612. 1891.

Low annual, 3 to 5 dm. high, repeatedly 2- to 4-chotomous, whitish or sometimes rusty-stellate throughout, at length papillate; lower leaves long petioled, orbicular; upper leaves ovate to oblong-ovate, entire, generally obtuse and mucronate, 1 to 4 (to 6) cm. long, cinereous below; petioles about one half the length of the leaves; racemes very short, about 1 cm. long; staminate flowers on bracteate pedicels 2 mm. long; calyx of 3 to 5 ovate sepals;

petals clavate, ciliate; pistillate flowers 1 to 4, from the base of the staminate raceme (apparently from the forks), pedicels 2 to 3.5 mm. long, becoming reflexed; sepals 5, oblong, about 1 mm. long; disc glandular; ovary 2-celled, puberulent; styles 2, biparted, short, 1.5 mm. long; capsule oval to ovate, 3 to 4 mm. long, 1-seeded by abortion of one of the ovules; seeds strongly biconvex, 3 to 3.5 mm. long.—Common on rocky hills and waste places, Iowa to Georgia and Texas and Mexico.

Specimens examined from Iowa (Burgess, 1879); Illinois (Buckley, no. 25; Vasey; Engelmann, 1860; Holton, 1844); Kentucky (Short, 1831, 1835); Missouri (Riehl, no. 106; Engelmann, 1834, 1842; Bush, 1888, 1890, nos. 336, 336a, 353, 879; Burgess, 1883; Glatfelter, 1895; Pammel, 1886; Fritchey; Dewart, 1892; Trelease, 1895, and several collections in 1897); Kansas (Carleton, nos. 180, 491; Shear, no. 166; Clothier, 1892; Stevens; Norton, 1892, no. 483; Hitchcock, 1892; Hall, 1869); Oklahoma (Waugh, 1893); Indian Territory (Butler, no. 1, in part, 1877; Palmer, 1863; Bush, no. 552); Arkansas (Nuttall; Harvey, no. 67; Beyrich, 1834; Pitcher; Trelease, 1897; Engelmann, no. 457); Mississippi (Pollard, no. 1311, 1896); Tennessee (Gattinger, "Curtiss, 2525," 1878; Curtiss, 1875; Robinson, no. 54; Bicknell, 1894); Georgia (Canby, Stone Mt., 1876; Small, 1895); Alabama (Buckley, 1821); Louisiana (Hale); Florida (Chapman); Texas (Lomas, no. 1, 1897; Drummond, 1833; Lindheimer, nos. 527, 692; Buckley, 1882; Heller, no. 1932; Reverchon, 1874; Palmer, no. 1243; Pammel, 1888; Wurzlow, no. 50; Jermy; Wright; Bigelow, 1852; Riddell, no. 7; Hall, no. 573); Texas and Mexico (Berlandier, nos. 441, 442, 946, 1762, 2376, 2532, in 1828-34. Pringle, no. 1913, Monterey, 1888).

III. Pistillate and staminate flowers apetalous; calyx 5-parted, never accrescent; dioecious, or sometimes monoecious in *C. punctatus*; stipules obsolete.

- A. Suffrutescent or perennial; branches scurfy, whitish.
 - a. Staminate racemes rarely exceeding 3 cm. in length.

C. PUNCTATUS Jacquin, Coll. ad Bot. Chem. et Hist. Nat. 1: 166. 1786; Icon. Plant. Rar. 3: 19. t. 621. 1789. *C. maritimus* Walter, Flor. Carol. 239. 1788, and most later writers. *C. disjunctiflorus* Michx. Flor. Bor. Am. 2: 215. 1803. *C. Plukenetii* Vahl, in Geisel. Crot. Monog. 40. 1807. Ex Muell. Arg. *Drepanadenium maritimum* Rafinesque, Neogenyton 2.

1860. *Hendecandra maritima* Klotzsch, in Wiegmann, Archiv für Naturgeschichte 7: 252. 1841. *Gynamblosis maritima* Baillon, Etud. Gen. Euphorb. 372. 1858. — Not *C. punctatus* Loureiro, Flor. Cochinchina 518. 1790; nor Coulter, Bot. West. Texas 397. 1894, which is *C. argyranthemus* Michx.

Perennial, diffuse, .5 to 1 m. high, di- or trichotomous; branches and inflorescence cinereous or rusty-tomentose; leaves elliptical, oblong, ovate; apex obtuse or acute; base truncate or cordate; entire or undulate; 1 to 5 cm. long; whitish, densely puberulent above; densely stellate-scaly, tomentose beneath; petioles one half to as long as the leaves; stipules obsolete; monoecious or dioecious; staminate raceme simple or branched, few to several flowered, interrupted and generally short, 1 to 2 cm. long, the lower part naked; pedicels 2 to 4 mm. long; bracts narrow and exceedingly deciduous; 5 to 6 subequal deltoid sepals; petals none or rudimentary; glands oval and scale-like; stamens about 12, barely exerted; filaments ciliate; pistillate raceme short, about 1 cm. long, with 1 to 3 sessile flowers; bracts deltoid; calyx parted into 5 equal, oblong or cuneate sepals; petals none; gland annular; styles 3, 3- to 4-parted, 1 to 2 mm. long; capsule subglobose, depressed, 5 to 8 mm. long, 6 to 11 mm. broad, trigastic; calyx not accrescent; seeds about 6 mm. long, dark or variegated; caruncle large, substipitate. — Common along the south Atlantic and Gulf coasts from North Carolina to Venezuela.— Plate 25.

Specimens examined as follows: Canby, 1867; McCarthy; Biltmore herb, 2117a; Hyman, 1876; Coville, no. 148, "about 25 miles from Wilmington, annual or perennial, a globular bush about one and a half feet high;" LeConte; M. A. Curtis, Sandy sea coast of N. C. 1845; Grosvenor, 1864; Chapman; Curtiss, 1875, nos. 2519, 5532; Garber, 1877; Simpson, 1889; Nash, no. 2438; Reynolds, 1875; Keeler, 1870-76; Weber, nos. 229, 486; Dean; J. D. Smith, 1882; Palmer, nos. 486, 1237; Underwood, 1896; Tracy, 1891, no. 4724; Frank, 1835; Buckley, 1882; Lindheimer, 1842; Wright; Robbins; Bodin, no. 67; Nealley, no. 58 = 458; Heller, no. 1423; Berlandier, 3213; Gregg, no. 3; Liebmann,

1841; Schott, 1851, no. 309 in 1865; no. 6 in 1867 and in Yucatan; Hitchcock, in Jamaica, 1890.

- C. CALIFORNICUS Muell. Arg. in DC. Prod. 15²:691. 1866; Watson, Proc. Am. Acad. Arts and Sci. 24:297. 1879; Bot. Cal. 2:69. incl. var. *major*. 1880; Greene, Flor. Francis. 89. 1891; Bot. Reg. San Francisco Bay 79. 1894; Coulter, Bot. West. Texas 400. 1894. *Hendecandra procumbens* Eschsch. [Mem. Acad. Petersb. 10:287. 1826], Linnaea, 3:150. 1828; Klotzsch, in Wiegmann, Archiv für Naturgeschichte 7:252. 1841; Baillon, Etude Gen. Euphorb. 372. 1858; Hook. and Arn. Bot. Beech. Voyage 389. pl. 91. 1841. *Croton procumbens* Torrey (in part), Bot. Mex. Bound. Surv. 195. 1859, and in Phanerog. Pac. N. A. (Wilkes Exped.) 453. 1874. Exclusive syn. Kunth; Watson, Bot. Geol. Expl. Exped. Fortieth Parall. (King's Exped.). 320. 1871. *Oxydectes Californica* Kuntze, Rev. Gen. Pl. 611. 1891.

Procumbent or ascending, 4 to 12 dm. high, suffruticose or fruticose in protected regions, sometimes caespitose, dichotomous; branches slender, cinereous throughout with a dense appressed sub-scaly scurf; petioles slender, 2 to 3.5 cm. long; stipules obsolete; leaves generally oblong, 2.5 to 5 cm. long, 8 to 18 mm. wide, sometimes elliptical-ovate, or obovate, base obtuse or narrowed, entire, 3- to 5-nerved, midvein prominent; silvery or green above; dioecious; staminate plants more slender and shorter branched; racemes simple, short, 2 to 3 cm. long, nude at base; flowers about 3 mm. broad, on slender pedicels 4 to 6 mm. long, soon deciduous; calyx of 5 ovate sepals; no petals; glands 5; oblong; stamens 12 to 15, barely exceeding the sepals; filaments ciliate; pistillate raceme 3 cm. long or less, mostly 2- to 3-flowered; bracts small; calyx of 5 ovate, obtuse sepals, no petals; glandular disc entire; styles 3, short, 2 to 2.5 mm. long, flat or terete, palmately 3- to 5-cleft or twice bicleft or bifid; capsule 3-celled, variable

in size, depending on number of seeds developed, in general 5 to 6 mm. tall, 6 to 7 mm. broad, depressed at apex, trigastic; seeds oval or globose, 4 to 5.5 mm. long, black or cinereous-variegated; caruncle prominent, triangular or reniform. — Plate 26.

Specimens examined from vicinity of San Francisco (Chamisso; Bolander, no. 2454, Capt. Wilkes' Expl. Exped.; Brandegee, 1885; Kellogg and Harford, nos. 236 and 900; Michener and Bioletti, no. 352a; Jones, no. 2383; Douglass); Santa Barbara and Monterey (Hartweg, 1949; Nuttall; Rich; Torrey, no. 479; Schott; Vasey, 1875; Rothrock, no. 113; Coulter, no. 666); other California localities (Vasey, no. 580, San Bernardino; Peckham, San Buenaventura, 1866, Ojai and vicinity, 1866; Brewer, no. 28, Los Angeles; Parry, San Diego to Monterey, 1850; Palmer, no. 444, southern part of San Diego Co. 1875; Eastwood, Brentwood, 1893; Eastwood (?), Saugus, Los Angeles Co.; Parish, no. 4448, Oceanside, San Bernardino, 1894; Anger, no. 191, Dd. Man. Alt. 1000 ft.; Orcutt, Smith Mt., 1882; Jones, 3030, Pasadena; Pringle, Wilmington, 1882: — the last two very close to var. *tenuis*).

C. CALIFORNICUS TENUIS n. comb. *C. tenuis* Watson, Proc. Am. Acad. Arts and Sci. 14:297. 1879; Bot. Cal. 2:69. 1880.

Low shrub, 3 to 7 dm. high, erect, branches very slender, densely scaly-stellate; leaves narrowly oblong to lanceolate, 2 to 4.5 cm. long, .5 to 1 cm. wide, entire, cinereous above, lighter and with a more metallic luster below; petioles short, 5 to 10 mm. long, less than half the length of the leaves; dioecious; staminate racemes simple, 1 to 3 cm. long, nude below, 5- to 20-flowered above, flowers small, about 2 mm. broad, on pedicels 3 mm. long, pentamerous, sepals ovate, petals none, stamens 10 to 12; pistillate flowers few, generally maturing only 1 or 2; styles very short; capsule trigastic, depressed, about 4 to 5 mm. tall; seeds oval to oblong, 3 to 4 mm. long; caruncle large. — Plate 27, f. 1.

Specimens examined from California (Cleveland, Potrero, 1876, no. 836, San Luis Rey, 1882; in Nat. Herb., San Diego; A. Gray, San Diego; Newhall, 1885; K. C. Newhall, 1883; Snyder, San Diego, 1894; Nevin, Los Angeles, 1878 and 1881. Insensibly passing into more erect and shrubby forms with slightly larger leaves, greener above: Parish,

vicinity of San Bernardino, alt. 1000-2500 ft., 1897; no. 3223; White-water, 1894; S. B. and W. F. Parish, no. 8, San Bernardino, 1881; Coville and Funston, no. 32, between San Bernardino and Redlands, alt. 300 m., no. 39, south slope of the San Bernardino Mts., alt. 650 m.; Henshaw, no. 118, Santa Ysabel; Lemmon, nos. 50, 51, 53; Sonora (Pringle, valley of the Alta river, 1884); Arizona (Pringle, sand washes of the Rilleta, 1881, with oblong seeds).

C. CALIFORNICUS LONGIPES n. comb. *C. longipes* Jones,
Proc. Cal. Acad. Sci. n. s. 5 : 721. 1895.

Shrubby at base, erect or ascending, 3 to 7 dm. high, dichotomous, freely branching from the lower portion of older stems, branches closely covered with strongly fringed scales; leaves ovate, elliptical or oblong, rounded or short cuneate at base, apex rounded, frequently apiculate, 2 to 4 cm. long, 1 to 2 cm. wide, grayish below, thinly stellate and generally green above; petioles rather long (1 to 2 cm.), one third to one half as long as the leaves; staminate racemes 2 to 3 cm. long; pedicels slender, 5 to 6 mm. long, bracts small or obsolete; flowers about 3 mm. broad; glands large, oval; stamens 10 to 13; filaments slightly ciliate; pistillate racemes about 2 cm. long, 5 to 8 flowers, on pedicels about 2 mm. long; bracts almost as long, calyx lobes broadly ovate, about 1 to 1.5 mm. long; capsule globose, about 5 mm. tall; seed elliptical, thick, 4 mm. long; caruncle oblong, large for the seed. "Abounds in sandy places, especially on drifting sand dunes in the valley of the Virgen and southward." Jones, l. c. — Plate 27, f. 2, 3.

Specimens examined from Utah (Jones, 5213, Leeds, Alt. 3500 ft.; no. 5024 *au*, Copper mine, Beaverdam Mts. (Utah?), no. 5149 *au*, Silver Reef, all in 1894; Palmer, St. George, 1875; Johnson, 1875). California (Fritchey, Arrow Head Springs, 1891; Orcutt, no. 1260).

C. CALIFORNICUS MOHAVENSIS n. var.

Low, 5 to 7 dm. high, much branched shrub, the typical forms characterized by their small oval to oblong leaves, .5 to 2 cm. long, 3 to 12 mm. wide, densely stellate-pubes-

cent on both sides; white beneath, slightly darker above; petioles 3 to 7 mm. long; staminate racemes short, 1 to 2 mm. long, .5 cm. of the base generally being nude; pedicels 2 mm. or less long; flowers 2 to 3 mm. broad, sepals ovate; stamens 6 to 10; pistillate racemes short, 1- to 3-flowered; styles 3, very short (1 to 1.5 mm. long), twice bicleft; capsule globose, small, about 3 mm. tall. — Intergrades with var. *longipes* and var. *tenuis*.

Specimens examined from California (Cooper, Soda Lake, Ft. Mohave, 1860-61, one of the forms included in *C. tenuis* by Watson; Eastwood, "Between Rose Sta. and Adobe Sta.; between Bakersfield and Tejon Pass, Kern Co., 1894." Common on the desert. "These plants are erect but with the branches curving inward at the top so that the effect of the whole is brushy, like a tumble-weed somewhat, or like *Eriogonum nidularium*, on a large scale, or like the Rose of Jericho;" Orcutt? in M. B. G. Herb; Emory, Colorado Desert, 1846; Schott, III., no. 5, Diluvial banks of the Colorado del Oeste, 1855; LeConte, Southern Cal.; S. B. and W. F. Parish, no. 1236, on the desert at Whitewater, 1882); Arizona (Palmer, no. 2, 1869, and one credited to N. Arizona, 1869; Lemmon, no. 236, Camp Lowell, 1880; Dr. Swart, no. 37, Verde river, 1866); Nevada (Bailey, no. 1918, Valley of the Virgen River, Lincoln Co.).

b. Staminate raceme usually 4 cm. or more long.

C. NEO-MEXICANUS Muell. Arg. Linnaea **34**: 141. 1865; DC. Prod. **15**²: 690. 1866; Coulter, Bot. West. Texas 400. 1894. *C. procumbens* Torrey, Bot. Mex. Bound. Surv. 195. 1859. — In part. *Oxydectes Neomexicanus* Kuntze, Rev. Gen. Plant. 612. 1891.

Suffruticose, several erect stems from a woody base, 3 to 16 dm. high, slender, dichotomous; stems, branches, lower side of leaves, and inflorescence densely covered with deeply radiate scales, the entire plant argenteous except the upper sides of the leaves which are generally green, not so scaly; leaves entire, narrowly oblong, lanceolate or elliptical, 1 to 4 cm. long, 5 to 15 mm. broad; petioles short, one fourth to half the length of the leaves; stipules obsolete; dioecious; staminate racemes 4 to 8 cm. long or longer, base nude, many flowered; bracts short, narrow; pedicels 3 to 4 mm. long; calyx equally 5-cleft, the sepals

lanceolate, thin; petals none, glands large; stamens 10 to 12, the filaments ciliate; pistillate racemes short, 2 to 3 cm. long, 1- to 3- or several-flowered; pedicels short, one fourth the length of the mature capsules; bracts small, broadly ovate; sepals ovate-oblong, obtuse; petals none; gland annular; styles 3, short, 1 to 1.5 mm. long, palmately 3- to 4-cleft; capsules globose, trigastic, 1- to 3-seeded, 5 to 6 mm. broad; seeds oval, 4 to 5 mm. long; caruncle stipitate, oblong. — Intergrades with *C. gracilis* Kunth, of central Mexico.— Plate 28.

Specimens examined from New Mexico (Thurber, no. 129. 1852; Pope, Junction of Delaware creek and Pecos river, 1855; Mulford, no. 102; Mearns, no. 158, Grant Co.; Wooton, no. 228, Las Cruces; Wright, nos. 1800, 1801, in 1852); Texas (Wright, no. 642; El Paso; Bigelow and Parry, Frontera; Schott, higher locations between Eagle Pass and the Pecos, 1852; Croft, no. 205, 212, San Diego; Buckley, 1882; Duffy, Ft. Stockton, 1860; Havard, no. 34, Colorado City; Nealley, no. 391 = 459, Ballinger, and no. 460 = 463, Chenate; Sweedy, Tom Green Co.; Reverchon, no. 875 = "Curtiss, no. 2525d," Rocky hills and plains on the Colorado River, Kimble and Taylor counties; Pope; Bigelow, dry arroyo, opposite Presido del Norte, 1852, with staminate racemes 21 cm. long and linear leaves, is possibly a variety; Nealley, no. 460, Chenate, is quite similar. A very small oval-leaved form collected "on heights near the Pecos," is possibly a variety); Mexico (Thurber, no. 810, Chihuahua; Berlandier, no. 3211, Nuevo Leon; Gregg, nos. 31, 59 and 375, Saltillo, no. 54, Buena Vista. From Dr. Gregg's notes we learn that the bark of the root is used by the inhabitants as a purgative).

B. Annual.

C. *TEXENSIS* (Klotzsch) Muell. Arg. in DC. Prod. 15²: 692. 1866; Engelmann, Bot. Wheeler Exped. 243. 1878; Coulter, Synop. Flor. Colorado 126. 1874; Man. Bot. Rocky Mt. Reg. 325. 1885; Bot. West. Texas 400. 1894; Chapman, Suppl. Fl. South. U. S. 648. 1883; S. Watson in A. Gray, Man. Bot. 459. 1890; Small in Britton and Brown, Ill. Flor. U. S. and Can. 2: 363. f. 2293. 1897. *C. muricatus*, Nuttall in Trans. Am. Phil. Soc. n. s. 5: 173. 1837; Torrey, Bot. U. S. and Mex. Bound. Surv. 195. 1859. *Hendecandra Texensis* Klotzsch in Wiegmann, Archiv für

Naturgeschichte 7: 252. 1841; Engelm. and Gray, Boston Jour. Nat. Hist. 5: 261. 1845; Torrey in Marcy, Expl. Red River 282. 1854; *Hendecandra ? multiflora* Torrey in Fremont's First Rept. 96. 1843. *Oxydectes Texensis* Kuntze, Rev. Gen. Plant. 613. 1891.

Annual, erect, slender, 4 to 16 dm. high, di- to trichotomous, stellate; stellates simple, the radiating hairs 10 to 15 in one series, more or less deciduous; leaves linear, lanceolate or oblong, 4 to 12 cm. long, .5 to 5 cm. broad, apex obtuse, acute or sometimes long acuminate, base rounded to obtuse, entire; stipules obsolete; petioles about 1 cm. long, seldom exceeding 2 cm.; staminate plant very slender, with longer internodes and narrower leaves; staminate flowers in short racemes, 1 to 3 cm. long, simple or rarely branched; bracts setaceous; flowers small, pedicels 4 to 5 mm. long; sepals thin; petals none; glands oval; stamens 8 to 12; filaments ciliate; pistillate flowers in short racemes of 1 to 4 or rarely more flowers; bracts setaceous to subfoliaceous; sepals deltoid; gland annular, sometimes lobed; styles about 2 to 3 mm. long, twice or more bicleft; stigmas 12 to 64; capsule 3-celled, 1- to 3-seeded, oval, 4 to 6 mm. tall, generally muricate; seeds orbicular, 3 to 4 mm. broad; caruncle prominent.—The size, form and degree of pubescence of the leaves are quite variable; otherwise the species is reasonably homogeneous throughout its range.—Plates 29, 30.

Specimens examined from Mexico (Berlandier, nos. 288, 1548; Schott, III, no. 6, Sta. Cruz, Sonora, 1856; South, San Ignacio Los Nogales, Sonora); Texas (Drummond, nos. 256 and II, 266; Lindheimer, nos. 241, 277, 305; Havard, nos. 31, 33; Heller, no. 1863; Thurber, no. 1, 1857; Palmer, no. 1242; Ravenel, 1869; Buckley, 1882; Wright; Letterman, no. 444; Pope; Pammel, 1888; Sallee, 1885; Reverchon, 1874, no. 874, 1882 = Curtiss, no. 2525b; Ferguson, 1900); Alabama (Mohr, no. 1, Danville, Talapoosa Co., 1877); Arkansas (Nuttall, Salt River); Missouri (Bush, Jackson Co., 1890; no. 3, Independence, 1886); Illinois (Hall and Harbour, no. 514; Hall, Athens 186-); Iowa (Hitchcock); South Dakota (Rydberg, no. 998; Hot Springs, Black Hills, 1892); Nebraska (Rydberg, 1890; nos.

363, 1430; Wilcox, 1888; Holmes, 1889; Clements, no. 2820; Webber, 1889; Swezey, no. 124; Lanhofer, 1887; Pammel, 1895; H. Engelmann, 1856 and 1858; Mersch, 1843); Wyoming (Nelson, no. 428, Fairbanks; Knowlton, no. 127); Utah (Bishop, 1872, resembles *C. virens*); Colorado (B. Smith, 1869; Redfield, no. 561; Cowen, 1892; Trelease; Tracy and Evans; Knowlton, no. 95; Jones, no. 586; Patterson, 1875; Parry, no. 325; Hall, "*cult*"; Vasey, 1868); Kansas (Sheldon, no. 324; Thompson, nos. 50, 187; Carleton, no. 260; Smythe, no. 121; Bodin, 1888; Redfield, 1872; Reed, 1892; Gurney, 1891; Norton, Dept. Bot. K. A. C., no. 484; Shear, no. 207; McKenzie, 1895); Indian Territory (Bush, no. 554; Palmer, no. 306; Sheldon, no. 272); Oklahoma (Waugh, 1893); New Mexico (Vasey, 1881; Crandall, no. 419; Heller, no. 3813; Rothrock, no. 37; Fendler, nos. 780, 781; Wislizenus, 1846; Jones, no. 4145; Mulford, nos. 1225, 1273, 1309); Arizona (Coues and Palmer, no. 534; Lemmon, nos. 52, 54; Santa Catalina Mts., 1881; no. 55, Chiricahua Mts., 1881; Hoyt, 1892; Mearns, 1884; Lemmon, nos. 284, 577; Pringle, 1881; Hough, no. 38; Parish, no. 240, Lowell; Swart, no. 14; McDougal, no. 536, Verde Valley; Tracy, 1887). Most of the forms in Arizona have very broad leaves, and rather low simple stems.

To the above belong the following of uncertain locations: D. Andrews, California [?]; Stansbury's Exped., July 20, 1850; James, Sources of the Canadian, 1835; Abert, Arkansas river; Emory, Sept. 26, 1846; Bigelow, Pecan Creek, Ft. Smith to Rio Grande, 1853-4; Vasey, no. 524, Rocky Mts. Lat. 40°-41°; Powell's Exped., 1868; Newberry, in McCombe's Exped., 1859; Marcy's Exped. to Red River, 1852; Fremont's First Exped., 1842; Fremont's Third Exped., nos. 146, 176, in 1845.

C. VIRENS Muell Arg. *Linnaea* 34:142. 1865. (Printed *vlrens*); DC. Prod. 15²:690. 1866. *Oxydectes virens* Kuntze, Rev. Gen. Plant. 613. 1891.

Annual, very slender, mostly alternately and laterally branched, dichotomous above; branchlets and inflorescence whitish; leaves oblong to lanceolate, obtuse at the ends, 2 to 5 cm. long, 7 to 15 mm. broad, entire; not papillate, glabrous, save for a few silvery stellates, not scales; the pluriserially radiating hairs depressed and persistent (somewhat deciduous in the closely related *C. Texensis*); staminate racemes short, 1 to 3 cm. long, rarely longer, simple or branched, nude below; pedicels slender, 5 to 7 mm. long; sepals small, thin, ovate; no petals; glands small; stamens 10 to 12; filaments subglabrate, exserted one third; pistillate racemes

short, 1- to 4-flowered, generally maturing only one, on pseudo-axillary pedicels 5 to 9 mm. long; calyx pentamerous; petals none; gland annular; styles 3, short, 2 mm. long, twice bicleft or palmately 3- to 4-cleft; capsule trigastic, depressed at apex, 5 to 6 mm. tall, 6 to 8 mm. broad, ochroleucous and coarsely stellate, not muriccate, yellowish; seeds oval, 4 to 5 mm. long, subplano-convex; caruncle small. — Dr. Engelmann considered this to be but a form of *C. Texensis*.* — Plate 31.

Specimens examined from New Mexico (Wright, no. 1799, 1851-2; Vasey, Sucaro, 1881); Mexico (Thurber, no. 760, Sand hills between Corrilitas and El Paso, 1852; Berlandier, no. 1407).

EXPLANATION OF PLATES.

The drawings were made by Mrs. Grace Johnson Vieh and Mrs. M. H. Duffey Irish from herbarium specimens selected by the author, and the details were in most cases drawn from camera sketches made by him. The habit drawings are reduced one half.

Plate 4, *C. Alabamensis*. — 1, 2, 3, Capsule, pistillate and staminate flowers, all $\times 3$.

Plate 5, *C. argyranthemus*. — 1, Staminate flower, $\times 4$; 2, staminate petals, $\times 6$; 3, calyx and capsule, $\times 4$; 4, inner view of a coccus, $\times 4$; 5, seed, $\times 4$; 6, Southwest Texas form.

Plate 6, *C. Berlandieri*. — 1, Staminate flower, $\times 4$, and petals of same, $\times 6$; 2, 3, old and young pistillate flowers, $\times 4$.

Plate 7, *C. fruticulosus*. — 1, Staminate flower, $\times 4$; 2, capsule, $\times 4$; 3, seed, $\times 6$.

Plate 8, *C. Sonorae*. — 1, Staminate flower, $\times 6$; 2, petal, $\times 6$; 3, lower portion of raceme, with pistillate flowers, $\times 3$; 4, seed, $\times 4$.

Plate 9, *C. suaveolens*. — 1, Pistillate calyx, $\times 6$; 2, portion of raceme, with pistillate flowers, $\times 4$; 3, capsule, $\times 4$; 4, seeds, $\times 4$.

Plate 10, *C. Torreyanus*. — 1, Staminate flower, $\times 6$; 2, pistillate flower, $\times 4$; 3, pistillate calyx, $\times 6$; 4, seed, $\times 5$.

Plate 11, *C. Cortesianus*. — 1, Pistillate branch; 2, staminate branch; 3, part of staminate flower, $\times 4$; 4, petal, $\times 4$; 5, pistillate calyx, $\times 8$; 6, young capsule, $\times 4$.

* Bot. Wheeler Exped. 243. 1878.

Plate 12, *C. linearis*, form *A.*—1, Staminate branch; 2, pistillate branch; 3, staminate flower, $\times 8$; 4, pistillate flower, $\times 6$; 5, styles, $\times 6$; 6, seed, $\times 8$.

Plate 13, *C. linearis*, form *B.*—1, Pistillate branch; 2, staminate branch; 3, staminate flower, $\times 8$; 4, pistillate flower, $\times 6$; 5, styles, $\times 6$; 6, seed, $\times 8$.

Plate 14, *C. betulinus*.—1, Staminate flower, $\times 8$; 2, pistillate calyx, and 3, young capsule of same, $\times 8$.

Plate 15, *C. Floridanus*.—1, Staminate flower, $\times 6$, and petal of same, $\times 8$; 2, pistillate calyx, $\times 4$; 3, capsule, $\times 4$; 4, seed, $\times 4$.

Plate 16, *C. glandulosus*, vars.—1, Var. *Shorti*; 2, var. *angustifolius*; 3, var. *Lindheimeri*.

Plate 17, *C. glandulosus septentrionalis*.—1, 2, Bracts, with glands, $\times 10$; 3, stellate hair, much enlarged; 4, petal and part of calyx, $\times 8$; 5, staminate flower, $\times 6$; 6, portion of capsule and calyx, $\times 4$; 7, seed, $\times 4$.

Plate 18, *C. capitatus*.—1, Stellate hair from calyx, enlarged; 2, staminate flower with buds above, and sepal, petal and stamen of same, all $\times 8$; 3, pistillate calyx, $\times 4$; 4, capsule, $\times 4$; 5, seed, $\times 4$.

Plate 19, *C. Engelmanni*.—1, Lower leaf, $\times \frac{1}{2}$; 2, staminate flower, $\times 2$, and sepal, petal and stamen of same, $\times 4$; 3, capsule, $\times 3$; 4, pistillate calyx, $\times 3$; 5, styles, $\times 3$; 6, seed, $\times 4$.

Plate 20, *C. Muelleri*.—1, Staminate flower and sepal, and 2, stamen and petal of same, $\times 8$; 3, seed, $\times 4$; 4, capsule, $\times 4$; 5, pistillate calyx, $\times 4$.

Plate 21, *C. Elliottii*.—1, Stamen, sepal and petal, $\times 8$; 2, pistillate calyx, $\times 2$; 3, staminate flower, $\times 8$; 4, capsule, $\times 4$; 5, seed, $\times 4$; 6, styles, $\times 6$.

Plate 22, *C. leucophyllus*.—1, Pistillate calyx, $\times 4$; 2, capsule and bracts, $\times 4$; 3, seed, $\times 4$; 4, sepal, petal and stamen, $\times 8$; 5, style, $\times 4$.

Plate 23, *C. corymbulosus*.—1, Staminate flower, $\times 6$; 2, petal and stamen from same, $\times 6$; 3, pistillate flower, $\times 6$; 4, capsule, styles removed, $\times 4$.

Plate 24, *C. Lindheimerianus*.—1, Bract, $\times 8$; 2, sepal and petal, $\times 8$; 3, capsule, $\times 4$; 4, staminate flower, $\times 6$; 5, seed, $\times 6$; 6, rachis, $\times 4$.

Plate 25, *C. punctatus*.—1, Pistillate plant; 2, monoecious plant.

Plate 26, *C. Californicus*.—1, Staminate plant; 2, pistillate plant; 3, staminate flower, $\times 6$; 4, capsule, $\times 4$; 5, style, $\times 4$; 6, seeds, $\times 4$.

Plate 27, *C. Californicus*, vars.—1, Var. *tenuis*; 2 and 3, var. *longipes*.

Plate 28, *C. Neo-Mexicanus*.—1, Staminate plant; 2, pistillate plant; 3, stellate scales from leaf, much enlarged; 4, staminate flower, $\times 8$; 5, styles, $\times 4$; 6, capsule, $\times 4$; 7, seed, $\times 4$.

Plate 29, *C. Texensis*, narrow leaved form of Southwest.—1, Pistillate plant; 2, staminate plant; 3, leaf detail, $\times 10$.

Plate 30, *C. Texensis*, broad leaved form of Northwest. — 1, Pistillate plant; 2, staminate plant; 3, staminate flower, $\times 8$; 4, styles, $\times 4$; 5, capsule, $\times 4$; 6, seed, $\times 4$.

Plate 31, *C. virens*. — 1, Portion of leaf showing stellate pubescence, $\times 10$; 2, staminate flower, $\times 6$; 3, capsule and calyx, $\times 4$.

INDEX.

(Synonyms are in parentheses.)

- Angelandra elliptica**, (60).
Argothamnia herbacea, (60).
Clutia Cascarilla, (46).
Croton Alabamensis, 38, 70. *pl.* 42.
 — **argyranthemus**, 39, 70. *pl.* 5.
 — **balsamiferus**, (40, 41).
 — **Berlandieri**, 40, (56), 70. *pl.* 6.
 — **betulinus**, 48, 71. *pl.* 14.
 — **Californicus**, 63, 71. *pl.* 26.
 — — **longipes**, 65, 66, 71. *pl.* 27.
 — — **major**, (63).
 — — **Mohavensis**, 65.
 — — **tenuis**, 64, 66, 71. *pl.* 27.
 — **capitatus**, 53, 71. *pl.* 18.
 — **Lindheimeri**, (54).
 — **Cascarilla**, (46).
 — **chamaedryfolius**, (49).
 — **Cortesianus**, 45, 70. *pl.* 11.
 — **corymbulosus**, 58, 59, 71. *pl.* 23.
 — **disjunctiflorus**, (61).
 — **Elliottii**, 56, 71. *pl.* 21.
 — **ellipticus**, (56, 59, 60).
 — **Engelmanni**, 54, 71. *pl.* 19.
 — — **albinoideis**, 55.
 — **eutrigynus**, (59).
 — **flavens**, 41.
 — **Floridanus**, 50, 71. *pl.* 15.
 — **fruticulosus**, 41, 70. *pl.* 7.
 — **glandulosus**, (51).
 — — **angustifolius**, 53, 71. *pl.* 16.
 — — **crenatifolius**, 52.
 — — **fuscescens**, (42).
 — — **Lindheimeri**, 50, 71. *pl.* 16.
 — — **pallescens**, (41).
 — — **scordioideis**, 52.
 — — **septentrionalis**, 51, 71. *pl.* 17.
 — — **Shorti**, 50, 71. *pl.* 16.
 — — **Simpsoni**, 51.
 — **gracilis**, 67.
 — **hippophaeoides**, (46).
 — **humilis**, (40, 41).
 — **leucophyllus**, 57, 71. *pl.* 22.
 — — **triseptalis**, 57.
 — **Lindheimeri**, (54).
 — **Lindheimerianus**, (58), 59, 71. *pl.* 24.
 — **linearis**, 46, 71. *pl.* 12, 13.
 — **longipes**, (65).
 — **maritimus**, (61).
Croton Miquelensis, 49.
 — **monanthogynus**, 35, 56, 59, 60.
 — **Muelleri**, 56, 71. *pl.* 20.
 — **muricatus**, (67).
 — **Neo-Mexicanus**, 66, 71. *pl.* 28.
 — **Plukenetii**, (61).
 — **Pringlei**, (42).
 — **procumbens**, (63, 66).
 — **punctatus**, (39), 61, (62), 71. *pl.* 25.
 — **Sonorae**, 42, 70. *pl.* 8.
 — **suaveolens**, 43, 70. *pl.* 9.
 — — **oblongifolium**, (44).
 — **tenuis**, (64).
 — **Texensis**, 34, 67, 69-72. *pl.* 29, 30.
 — **tomentosus**, (60).
 — **Torreyanus**, 44, 70. *pl.* 10.
 — **trichocarpum**, (45).
 — **virens**, 69, 72. *pl.* 31.
Drepanidium maritimum, (61).
Engelmannia Nuttalliana, (60).
Eriogonum nidularium, 66.
Geiseleria chamaedryfolia, (49).
 — **glandulosa**, (51).
Gynamblosis maritima, (62).
 — **monanthogyna**, (60).
Hendecandra maritima, (62).
 — **multiflora**, (68).
 — **procumbens**, (63).
 — **Texensis**, (67).
Heptallon aromaticum, (56).
 — **graveolens**, (53).
Oxydictes argyranthemus, (39).
 — **Berlandieri**, (40).
 — **Californica**, (63).
 — **elliptica**, (59).
 — **fruticulosus**, (42).
 — **Lindheimeri**, (58).
 — **monanthogyna**, (60).
 — **Neomexicanus**, (66).
 — **Texensis**, (68).
 — **virens**, (69).
Pilinophytum capitatum, (58).
 — **Lindheimeri**, (54).
Ricinoides, (33).



CROTON ALABAMENSIS.



CROTON ARGYRANTHEMUS.



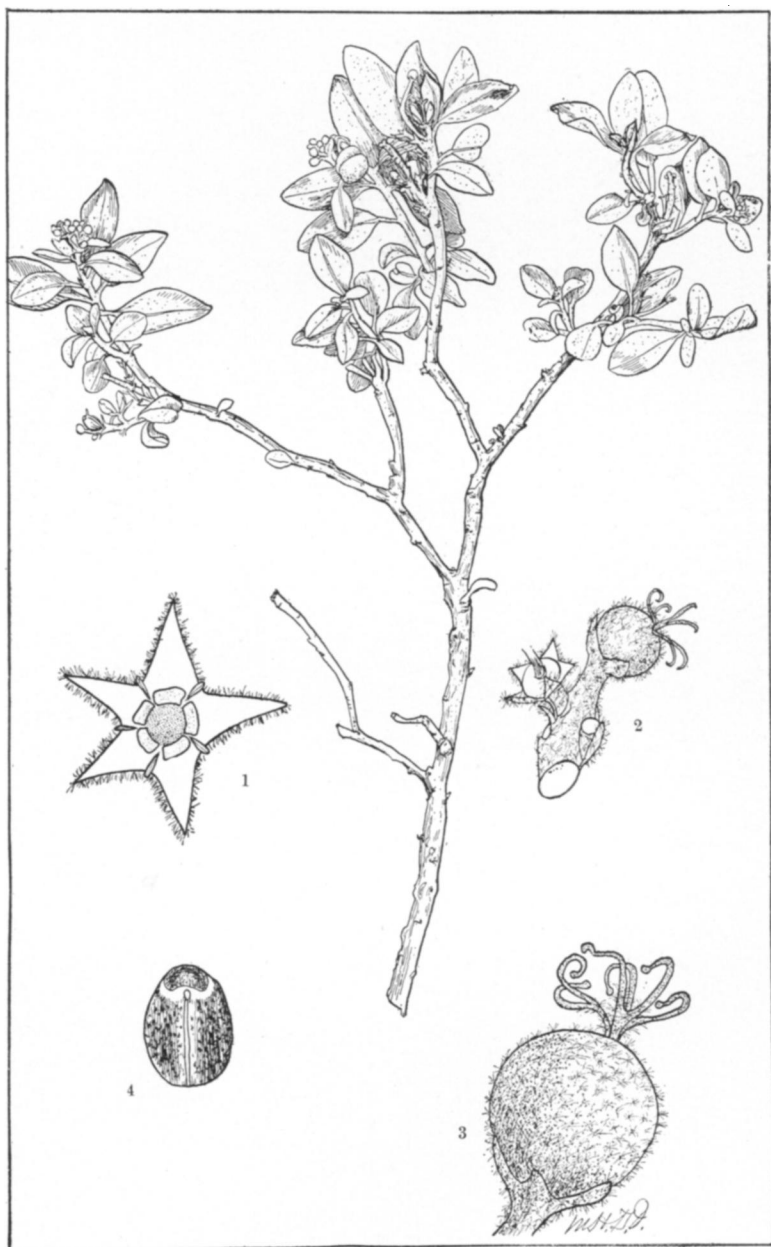
CROTON BERLANDIERI.



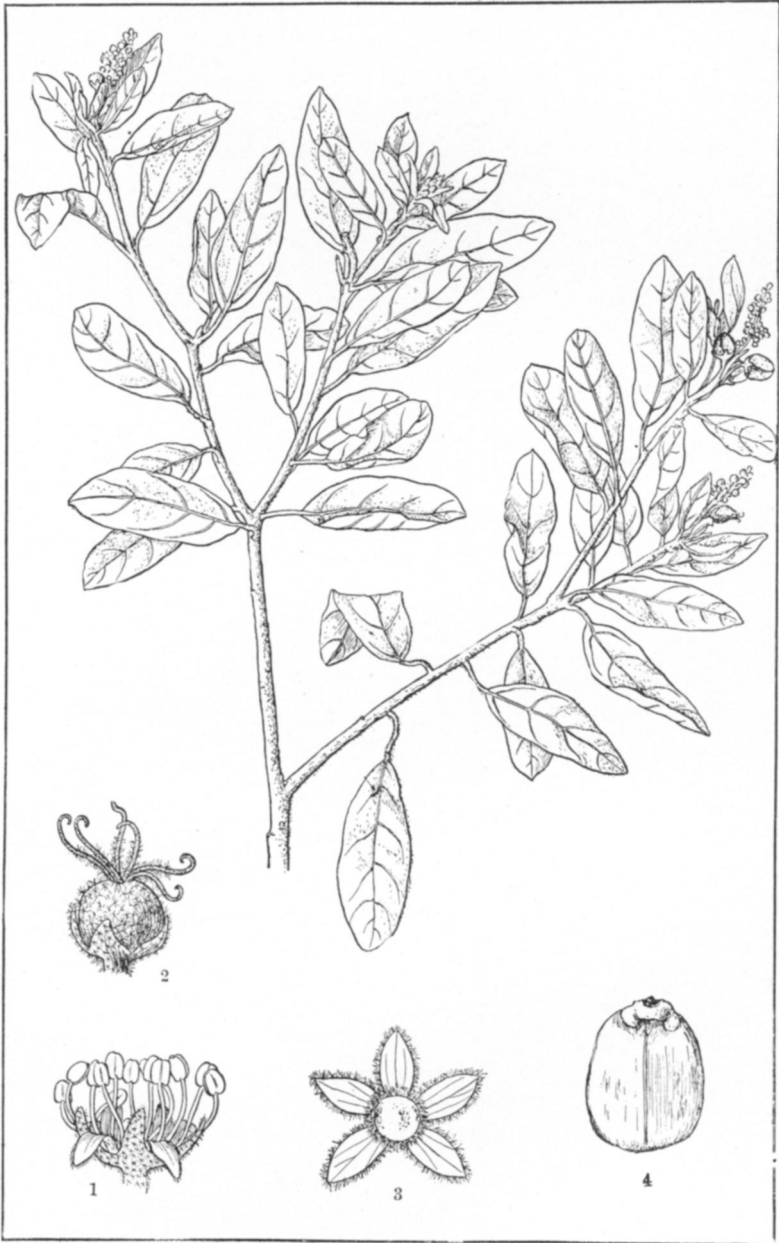
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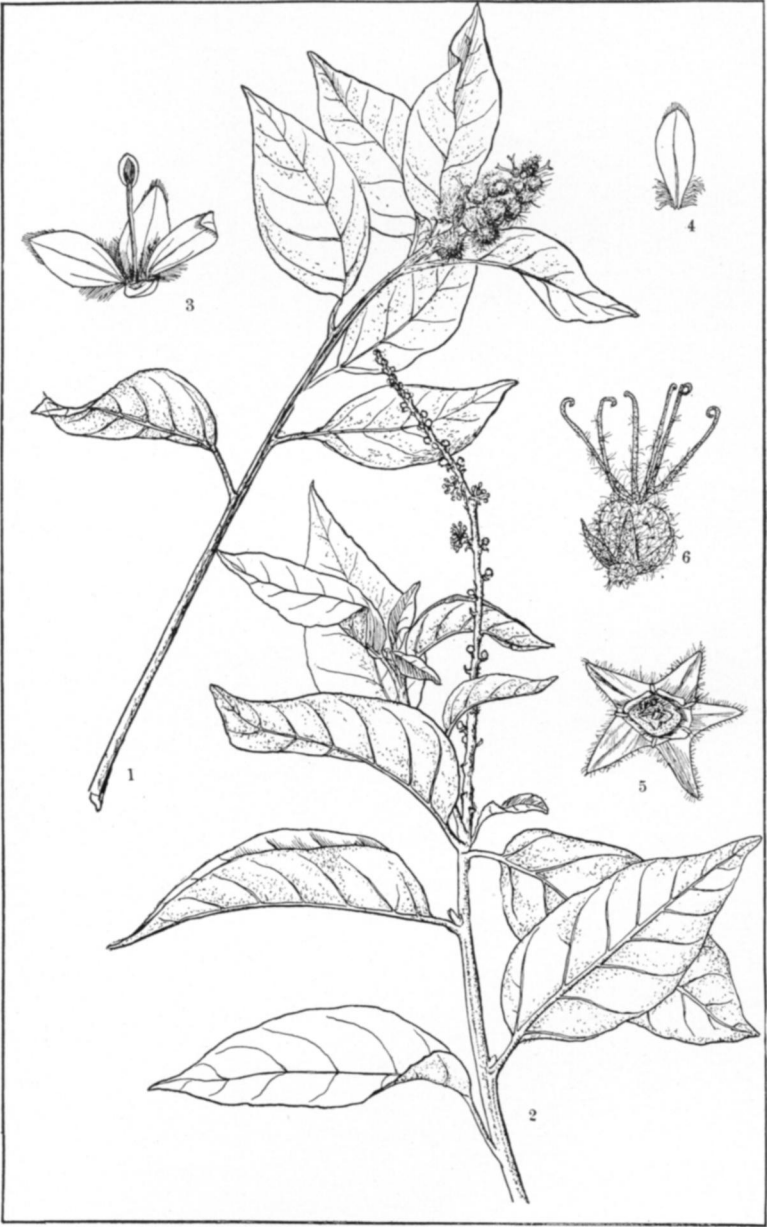
CROTON SONORAE.



CROTON SUAVEOLENS.



CROTON TORREYANUS.



CROTON CORTESIANUS.



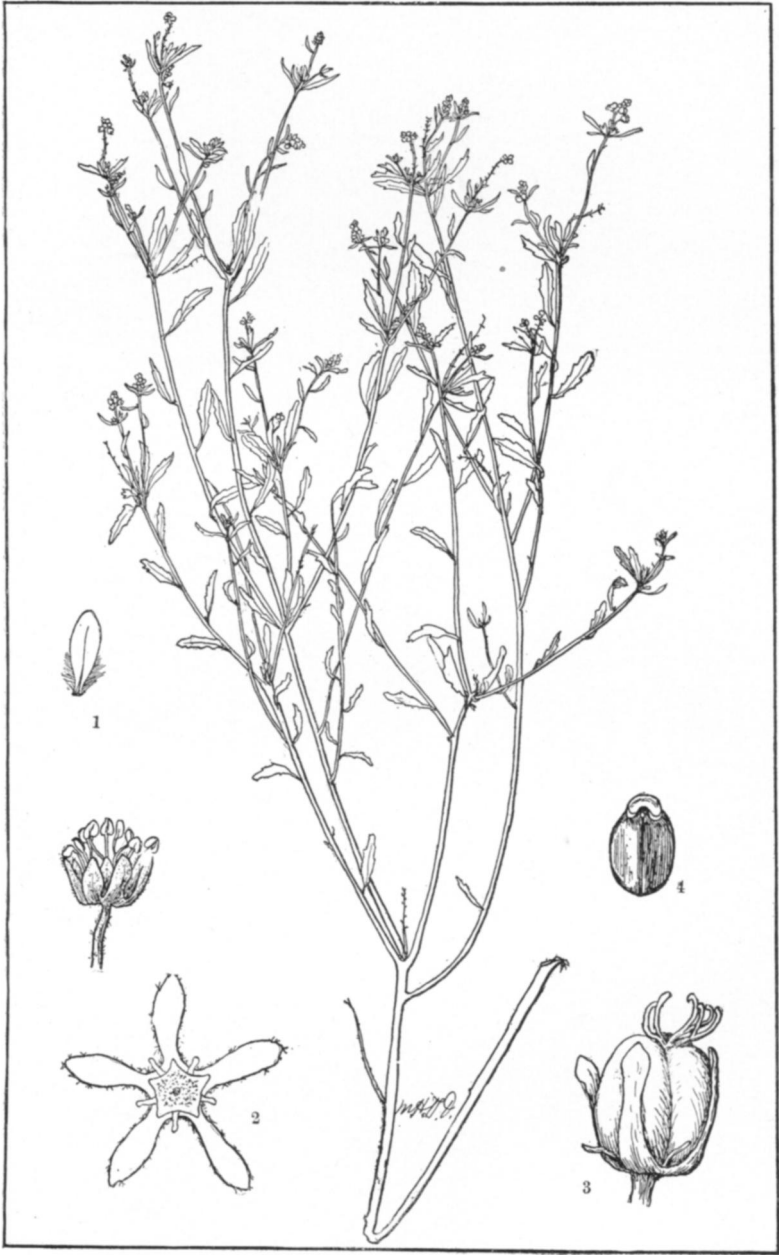
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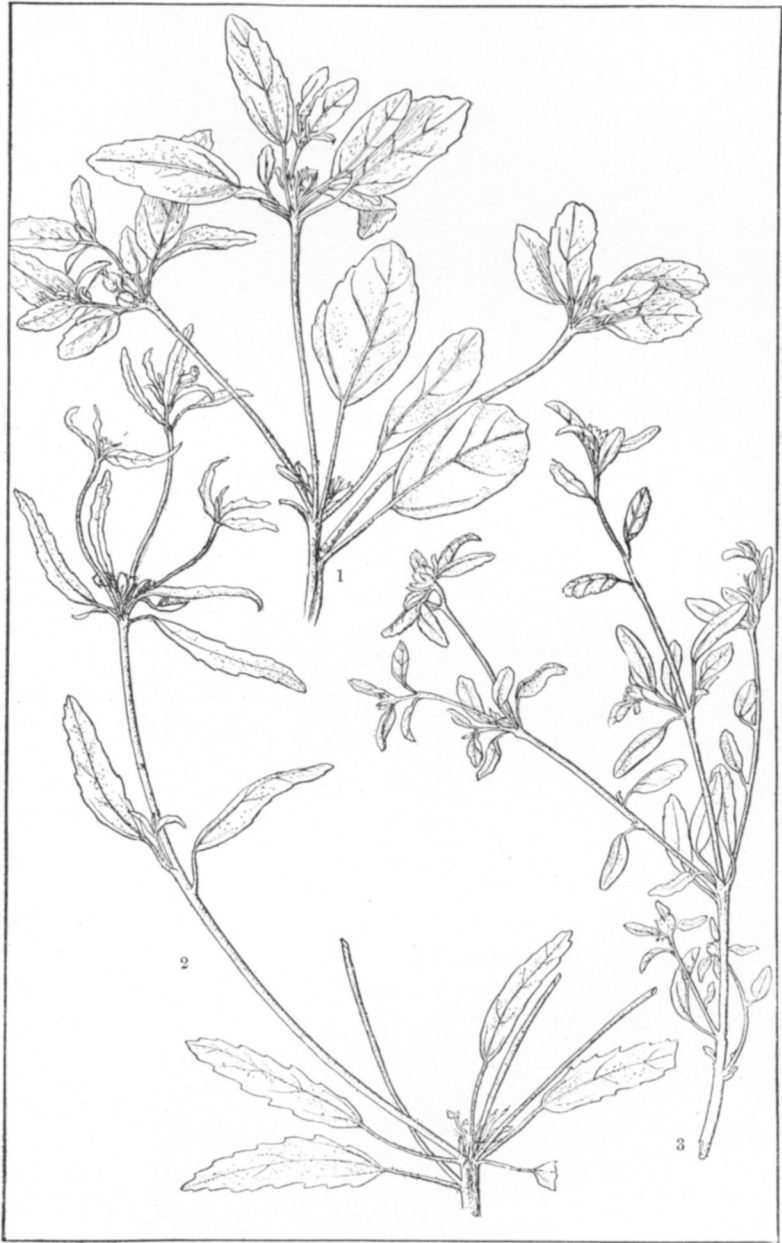
CROTON LINEARIS, FORM B.



CROTON BETULINUS.



CROTON FLORIDANUS.



CROTON GLANDULOSUS, VARIETIES.



CROTON GLANDULOSUS SEPTENTRIONALIS.



CROTON CAPITATUS.



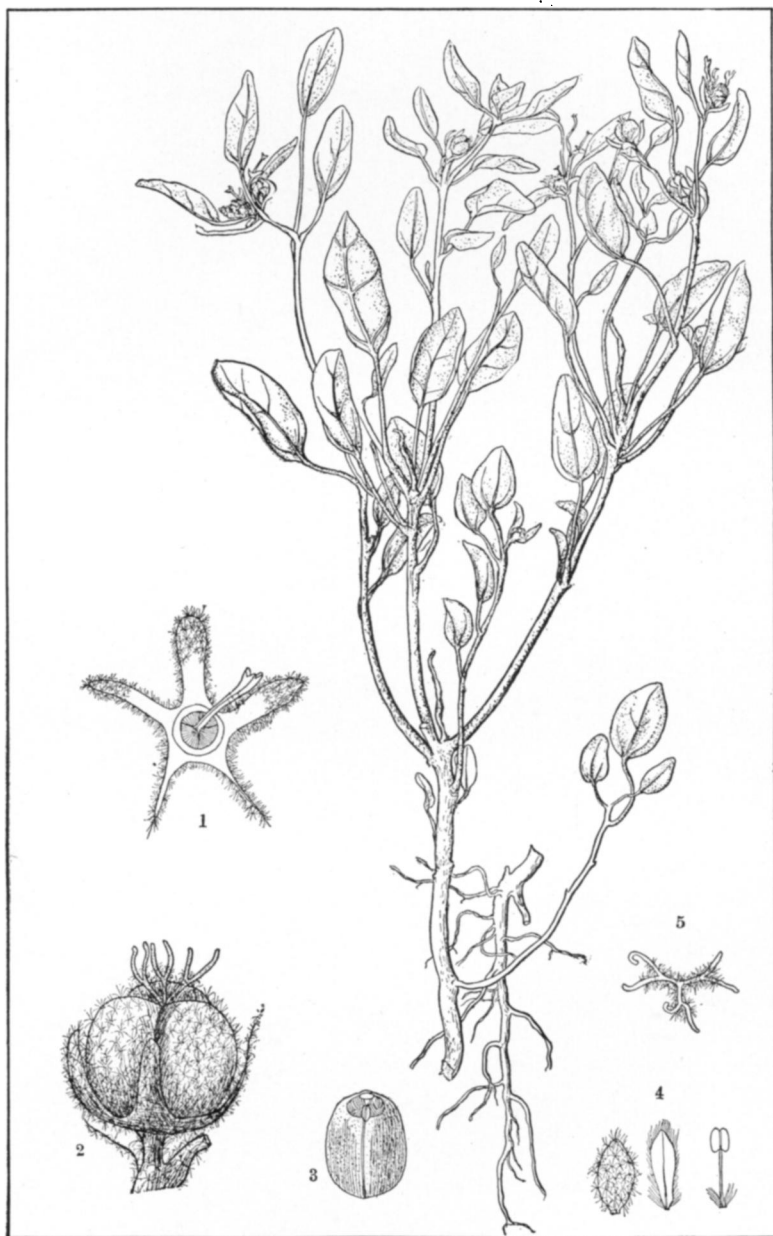
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CROTON MUELLERI.



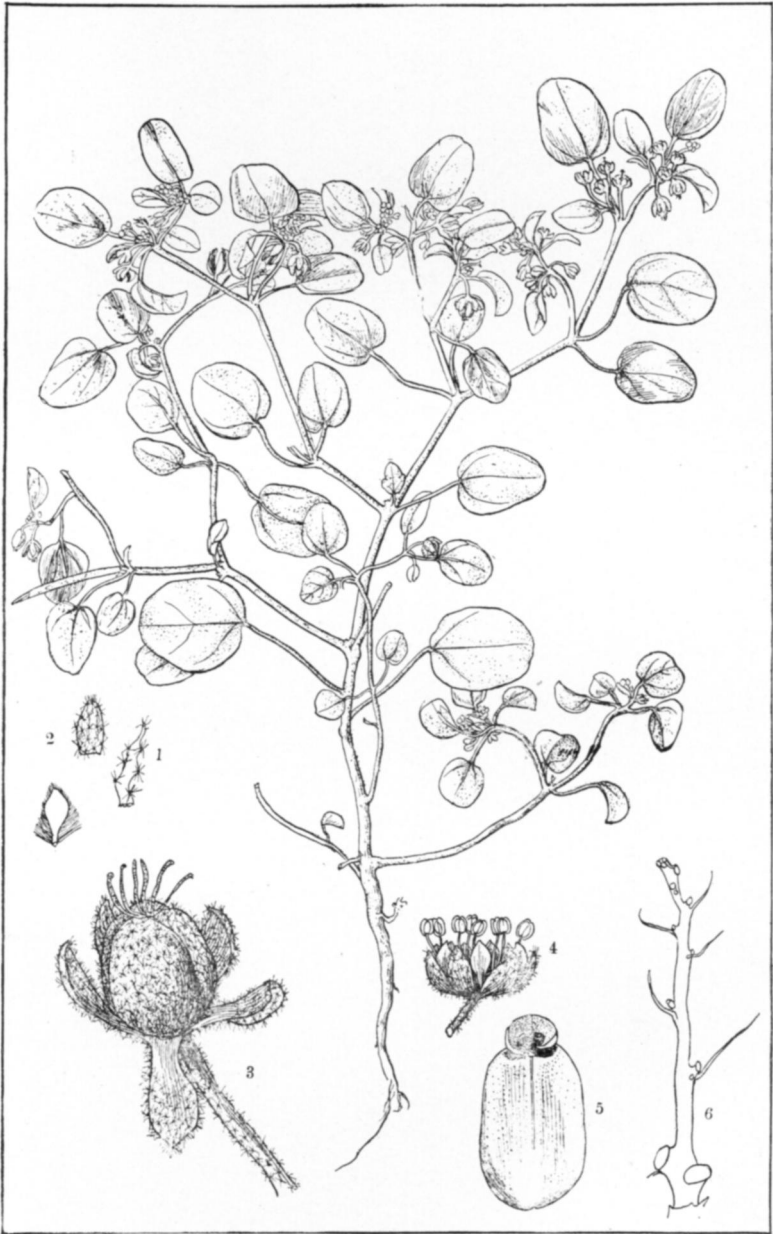
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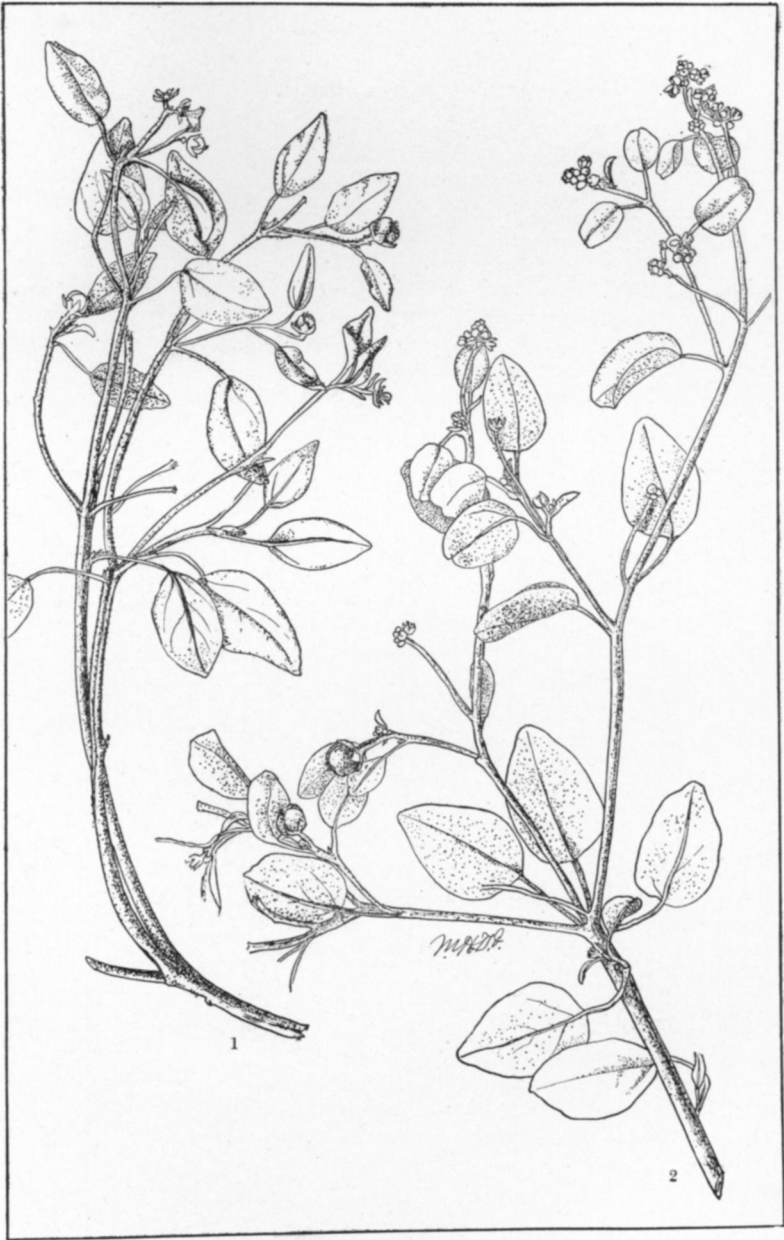
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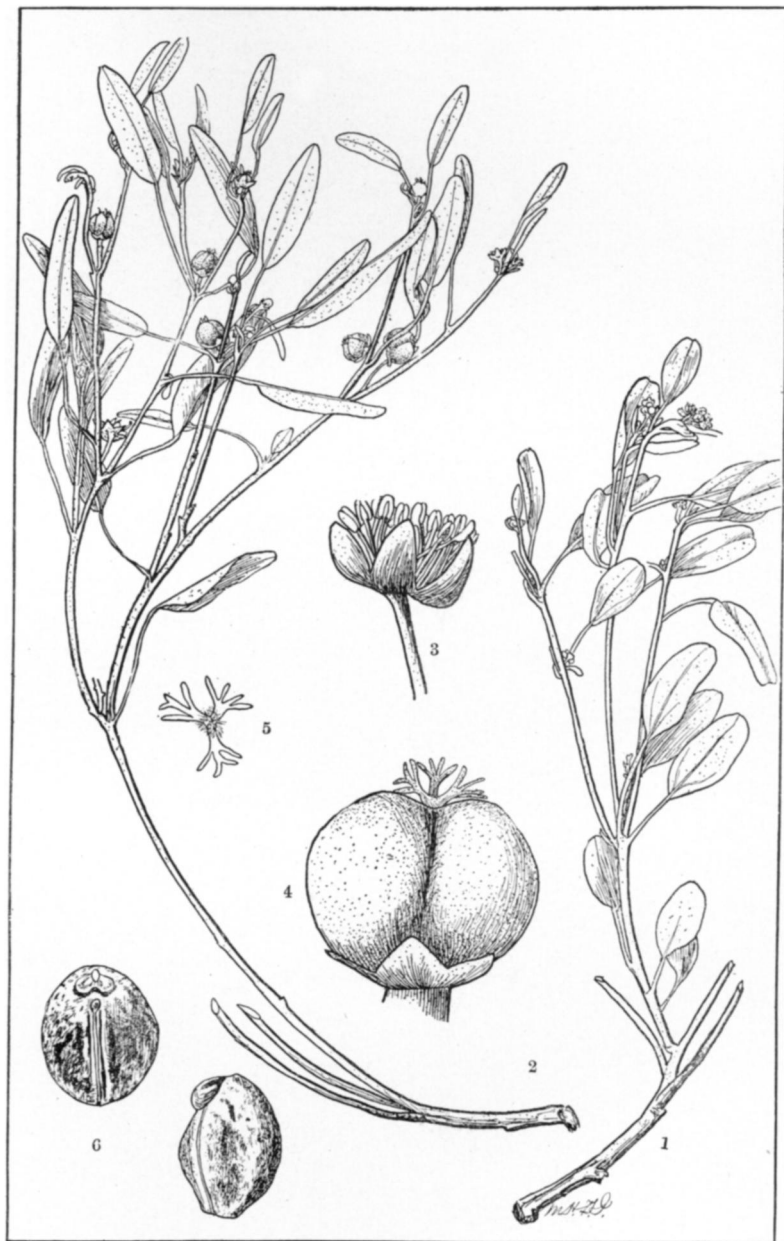
CROTON CORYMBULOSUS.



CROTON LINDHEIMERIANUS.



CROTON PUNCTATUS.



CROTON CALIFORNICUS.



CROTON CALIFORNICUS, VARIETIES.



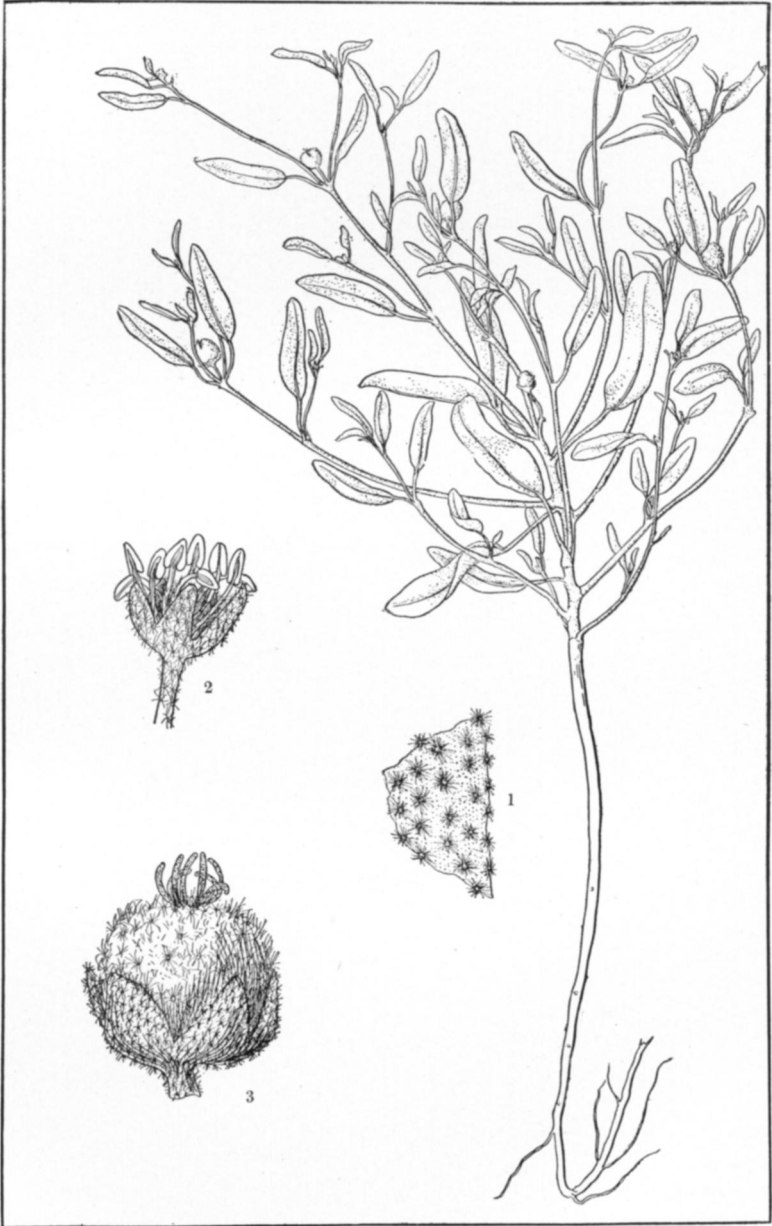
CROTON NEO-MEXICANUS.



CROTON TEXENSIS.



CROTON TEXENSIS



CROTON VIRENS.